PB 203 358

SUMMARY REPORT

on

SURVEY OF COMMERCIALLY AVAILABLE CATALYST AND SORBENT MATERIALS

to

NATIONAL AIR-POLLUTION CONTROL ADMINISTRATION
(Contract PH-86-68-84, Task 13)

July 17, 1969

by

R. H. Cherry, Jr., D. P. Moon, S. A. Rubin, and R. T. Niehoff

Reviewed by G. F. Sachsel
and R. J. Favor

BATTELLE MEMORIAL INSTITUTE
Columbus Laboratories
505 King Avenue
Columbus, Ohio 43201

Reproduced by
NATIONAL TECHNICAL
INFORMATION SERVICE
Springfield, Va. 22151

3

318

BIBLIOGRAPHIC DATA SHEET

1. Report No. APTD-0685

2.

3. Recipient's Accession No.

4. Title and Subtitle
Survey of Commercially Available Catalyst and Sorbent Materials

5. Report Date
July 17, 1969

6.

7. Author(s) R. H. Cherry, Jr., D. P. Moon, S. A. Rubin, and R. T. Niehoff

8. Performing Organization Rept. No.

9. Performing Organization Name and Address
Battelle Memorial Institute
Columbus Laboratories
505 King Avenue
Columbus, Ohio 43201

10. Project/Task/Work Unit No.

11. Contract/Grant No.
PH 86-68-84

12. Sponsoring Organization Name and Address
Environmental Protection Agency
Office of Air Programs
Research Triangle Park, North Carolina 27711

13. Type of Report & Period Covered
Summary

14.

15. Supplementary Notes

16. Abstracts

An abbreviated catalog of catalyst, carrier and sorbent materials has been prepared from published and available manufacturer's information. Information on types, properties, usages, and costs has been collected. This information has been extracted and assembled for sorting, adjusting, arranging, and printing in logically meaningful arrays using a specially-developed Fortran IV catalog logic compatabile with the CDC 6400 digital computer. This catalyst materials survey is useful in its present form for data storage and comparison, for screening, and as a decision-making tool. It cannot at present provide the guidelines or criteria for designing or choosing new catalyst-material candidates.

17. Key Words and Document Analysis. 17a. Descriptors

Air pollution control
Sorbents
Sorption
Catalysts
Physical properties
Data acquisition
Data storage
Surveys
Costs

17b. Identifiers/Open-Ended Terms

17c. COSATI Field/Group 13/B

18. Availability Statement
Unlimited

19. Security Class (This Report)
UNCLASSIFIED

20. Security Class (This Page)
UNCLASSIFIED

21. No. of Pages
318

22. Price

FORM NTIS-35 (10-70)

USCOMM-DC 40329-P71

U.S. DEPARTMENT OF COMMERCE
National Technical Information Service
5285 Port Royal Road
Springfield, Virginia 22151

RECEIVED
NATIONAL TECHNICAL
OCT 8 1971
INFORMATION SERVICE

July 20, 1971

Environmental Protection Agency
Office of Air Programs
Post Office Box 12055
Research Triangle Park, N.C. 27709

Re your report: Battelle Memorial Institute, Survey of Commercially Available Catalyst and Sorbent Materials

Gentlemen:

Subject document is returned unprocessed for the reason indicated below.

Please resubmit to NTIS after you have made the necessary correction.

☐ 1. Missing pages.

☒ 2. Pagination missing. To insure completeness, suggest author or editor number the pages consecutively throughout, or within chapters if prefixed by chapter designation. Appendix E

→ A RECOUNT OF EVERY PAGE OF THIS DOCUMENT, INCLUDING THE TITLE PAGE = 318 pages

☐ 3. Pages (portions) not reproducible.

☐ 4. Copyright or other limitation. Furnish authority for NTIS to reproduce and sell to the public.

* ☒ 5. ~~Completed COSATI[1] Standard Title Page missing (enclosed)~~: Please complete the Standard Title Page.

☐ 6. We offer to announce your report available from source if you submit completed Standard Title Page (enclosed).

☐ 7. Completed Accession Notice Card missing (enclosed).

☒ 8. Document is more than 2 years old. Please indicate if there is a continuing demand for this document and what the total annual demand would be. We reserve the right not to accession.

→ Document is a contract Report - All of such are being put in NTIS TO OFFER TO THE PUBLIC. THERE IS NO ESTIMATE AT THIS TIME OF THE TOTAL ANNUAL DEMAND.

☒ 9. Other: Confirming telephone conversation between Halpin/Ashley, July 20, 1971.

Sincerely,

Do Not Photograph

B W. Thott

(PB-203 358

BO W. THOTT
Chief, Input Section
321-8517 YL

Case file

---

[1] Committee on Scientific and Technical Information, Guidelines to Format Standards for Scientific and Technical Reports Prepared by or For the Federal Government, 1968. Available from NTIS for $3.00 in paper copy, $0.95 in microfiche under PB-180 600.

A

FORM NTIS-63 (11-70) USCOMM-DC 40669-P71

FOR additional Information Contact: Mrs. Delores Evans, Input Sectio

Battelle Memorial Institute · COLUMBUS LABORATORIES

505 KING AVENUE COLUMBUS, OHIO 43201 · AREA CODE 614, TELEPHONE 299-3151 · CABLE ADDRESS: BATMIN

November 4, 1969

Mr. Mark Hooper
Process Control Engineering Division
National Air Pollution Control
  Administration
5710 Wooster Pike
Cincinnati, Ohio 45227

Dear Mr. Hooper:

Summary Report
Contract PH-86-68-84, Task 13
"Survey of Commercially Available Catalyst
and Sorbent Materials"

Enclosed are 20 copies of the summary report on Task 13, in which is assembled the available information on approximately 360 commercial catalysts, carriers, and sorbent materials.

This survey is useful in its present form for data storage and comparison, for screening, and as a decision-making tool. It cannot provide the guidelines or criteria for designing or choosing new catalyst-material candidates. These must still be supplied by experience, and by knowledge of general trends as reflected by similar successful applications.

The detailed information necessary for the evaluation or estimation of the physical strength of materials of interest is generally not given in the printed manufacturers' information used as a basis for this survey. Any approach to the evaluation of physical strength as a function of temperature and gaseous environment must be based on practical knowledge, past experience, and common sense. It is known that catalytic or sorbent activity and physical strength are frequently opposed. Rapid temperature cycling, which may be caused by high local rates of heat release by chemical reaction, is often cited as a major cause of loss of physical integrity.

At the present time it is feasible to select catalyst and sorbent materials from this survey only on the basis of probable physical stability in the required gaseous environments, and this only on a practical, common sense basis. Chemical stability and catalytic activity cannot be determined or inferred from the information surveyed, with the exception that given materials are known to have been applied in specific process systems designed for the abatement of SO_x or NO_x emissions.

The program logic and computer software developed for this task can be expanded both in size and in ability to handle automatic search procedures, which are done manually at the present time. The general-purpose program is capable of expansion up to the limits of any available computer compatible with a FORTRAN IV program format.

Sincerely yours,

RH Cherry Jr

R. H. Cherry, Jr.
Chemical Process Development
Division

RHC:ljr

Enclosures (20)

TABLE OF CONTENTS

Page

INTRODUCTION 1

SUMMARY 2

RESULTS 2

Acquisition of Information 2

Sorting and Tabulation of the Available Information 3

DISCUSSION 6

General Considerations 6

Practical Considerations 7

Physical Stability 7

Chemical Stability 8

Cost Data 8

Examples of the Use of This Survey 8

CONCLUSIONS AND RECOMMENDATIONS 10

BIBLIOGRAPHY 11

APPENDIX A

MULTIPLE-ENTRY MASTER TABLES FOR QUICK COMPARISONS

APPENDIX B

SORTED, SINGLE-VALUED SEARCH LISTS FOR SELECTED PROPERTIES

APPENDIX C

SELECTED, TWO-VALUED COMPARISON TABLES

APPENDIX D

A COMPUTER LOGIC FOR CATALOGING, SORTING, AND TABULATION

TABLE OF CONTENTS (Continued)

APPENDIX E

THESAURUS OF CODES IDENTIFYING THE MATERIALS MANUFACTURERS

APPENDIX F

BLITZ TABLES: THE AVAILABLE INFORMATION FOR EACH MATERIAL

LIST OF TABLES

TABLE 1. LIST OF PROPERTIES TABULATED FOR EACH MATERIAL

TABLE A-1 MASTER TABLE SORTED ON MATERIAL CODE

TABLE A-2 MASTER TABLE SORTED ON CLASSIFICATION

TABLE A-3 MASTER TABLE SORTED ON COMPOSITION

TABLE B-1 COST AND SECONDARY COMPOSITION

TABLE B-2 SECONDARY COMPOSITION

TABLE B-3 AVAILABLE SIZES

TABLE B-4 AVAILABLE SHAPES

TABLE B-5 CRUSHING STRENGTH

TABLE B-6 HARDNESS

TABLE B-7 PORE SIZE

TABLE B-8 PORE VOLUME

TABLE B-9 SURFACE AREA

TABLE B-10 BULK DENSITY

TABLE B-11 CRYSTALLINITY

TABLE B-12 CRYSTALLITE SIZE

TABLE B-13 IGNITION LOSS

TABLE B-14 PARTICLE DENSITY

TABLE B-15 MAXIMUM SERVICE TEMPERATURE

TABLE B-16 ATTRITION

TABLE OF CONTENTS (Continued)

TABLE C-1 PORE VOLUME VS. PORE SIZE
TABLE C-2 SURFACE AREA VS. PORE SIZE
TABLE C-3 SURFACE AREA VS. MAXIMUM TEMPERATURE
TABLE C-4 BULK DENSITY VS. PARTICLE DENSITY
TABLE C-5 BULK DENSITY VS. ATTRITION
TABLE C-6 ATTRITION VS. HARDNESS

SURVEY OF COMMERCIALLY AVAILABLE
CATALYST AND SORBENT MATERIALS
(Contract PH-86-68-84, Task 13)
(Mark Hooper, Project Monitor)

by

R. H. Cherry, Jr., D. P. Moon, S. A. Rubin, and R. T. Niehoff

INTRODUCTION

The National Air Pollution Control Administration is currently expending considerable effort to develop large-scale systems for controlling SO_2 and SO_3 emissions from stationary sources. A similar, more recently initiated effort aimed at the development of processes to control NO_x emissions is also in progress.

One way to control SO_x and NO_x emissions in stationary-source flue gases involves treatment of the gases with a sorbent or catalyst which will sorb and/or react specifically with these pollutants and so remove them from the gas stream. Several NAPCA projects have been aimed at the preparation of reactive, stable, and physically-tough sorbents for SO_x removal.

It has been suggested that a knowledge of the characteristics of all, or at least a representative sampling, of the commercially-available catalysts, catalyst supports, and sorbents that have been developed for other purposes might prove useful in indicating which specific materials warrant consideration in a program for the development of sorbents and catalysts for SO_x or NO_x control. A survey of the properties, uses, and costs of commercially available materials might help NAPCA to limit consideration to those groups of materials which are practical in terms of cost,apparent physical stability, and other factors.

Based on published and available manufacturer's information, an abbreviated catalog of catalyst, carrier, and sorbent materials has been prepared. Information on types, properties, usages, and costs (where available) has been collected. This information has been extracted and assembled for sorting, adjusting, arranging, and printing in logically meaningful arrays using a specially-developed Fortran IV catalog logic compatible with Battelle's CDC 6400 digital computer.

The catalog logic and computer algorithm have been arranged to permit sorting and classifying the list of materials and materials properties according to function or type of material as well as composition. Listed physical properties, where available, include:

- available sizes
- available shapes
- hardness
- crushing strength
- pore size

- pore volume
- surface area
- bulk density
- crystallinity
- crystallite size
- maximum operating temperature
- attrition rate
- loss on ignition (or valatility).

In addition, the stated current uses, and other pertinent comments on the material, are listed.

NAPCA is interested in assessing, if possible, the physical strength of these materials at temperatures ranging from 300-1500 F in gaseous environments including a typical power plant flue gas, hydrogen, steam, carbon monoxide, and carbon dioxide. This information, in the main, is not available from the published brochures that were the source of input information in this work.

SUMMARY

The available information on approximately 360 commercial catalysts, catalyst carriers, and sorbent materials has been collected, assembled, and sorted to produce the 26 tabulations of Appendixes A, B, C, and F.

This catalyst materials survey is useful in its present form for data storage and comparison, for screening, and as a decision-making tool. It cannot at present provide the guidelines or criteria for designing or choosing new catalyst-material candidates. These must still be supplied by experience, and by knowledge of general trends as reflected by similar successful applications.

RESULTS

A general-purpose, data storage and retrieval program has been written in FORTRAN IV language, specifically for Battelle's CDC 6400 computer system, and capable of expansion up to the limits of any available computer compatible with a FORTRAN IV system. The program logic and operation are discussed in detail in Appendix D which contains a detailed description of the program options available to the user, as well as the FORTRAN IV source deck listing, and the command deck listing.

Acquisition of Information

The information processed in this study has been obtained from brochures, catalogs and other published materials supplied by various catalyst, carrier, and sorbent manufacturers. From these published brochures all the available information on approximately 360 materials has been extracted and punched into cards for input to the computer program.

Each material is given a code number. For each material, there are 20 coded pieces of information, each piece consisting of both numeric and alphanumeric parts. Each numeric value may be augmented by up to 30 spaces of appropriate comments. These codes are listed in Table 1.

It should be noted that all this information, while desirable, is simply not available in the published information supplied by the manufacturers.

The effort required, for example, to actually fill up completely the input-data table so that each material has listed all 20 of its properties would require a tremendous effort. In fact, most of this information may not be available even if each company were questioned specifically for information which does not appear in their printed material. One therefore hopes to strike a balance between the time it would take to supply complete information against the need for completeness. These, of course, are judgments of a technical and economic nature.

Sorting and Tabulation of the Available Information

At present, information on approximately 360 materials has been included in the data store. This information has been sorted and processed as follows. In Appendix A, three master tables have been prepared for quick comparison of the available alphanumeric information. Table A-1 has been sorted on increasing value of the material code. Table A-2 has been sorted on name and classification. Table A-3 has been sorted on material composition. All three tables contain the same information:

Column	Information
1	Material code
2	Name and classification
3	Composition
4	Major uses
5	Major uses, continued
6	Comments
7	Material code

These three tables present the alphanumeric information that has not been presented elsewhere. The information has been sorted three ways to make it easier for the user to identify materials of interest when the material code, or the name, or the approximate composition is known.

TABLE 1. LIST OF PROPERTIES TABULATED FOR EACH MATERIAL

Property Code	Property or Information	Units of Numeric Field	Remarks Pertaining to Alphanumeric Field
01	Name	None	CAT = catalyst, CRR = carrier or support, SOR = sorbent, followed by appropriate name of catalyst and base, or carrier, or sorbent
02	Composition	None	Alphanumeric only
03	Cost/secondary material	\$/ton	Secondary components if known or specified
04	Size	--	As specified here
05	Shapes	--	Alphanumeric only
06	Crushing strength	lb_F	With pellet size or comment
07	Hardness	--	Shows units
08	Average pore size	Angstroms	
09	Pore volume	cc/gm	
10	Surface area	m^2/gm	
11	Bulk density	lb/ft^3	
12	Crystallinity	None	Descriptive only (e.g., α - alumina)
13	Crystallite size	Angstroms	
14	Major uses	--	
15	Major uses	--	
16	Volatility or loss on ignition	Percent loss	Temperature given, if specified
17	Particle density	lb/ft^3	
18	Maximum usage temperature	°F	Highest temperature recommended in service or during regeneration
19	Attrition	Percent	
20	Comments	--	Alphanumeric only

Appendix B contains 16 single-valued search tables:

Table	Contents
B-1	Cost, Secondary Composition
B-2	Secondary Composition
B-3	Available Sizes
B-4	Available Shapes
B-5	Crushing Strength
B-6	Hardness
B-7	Pore Size
B-8	Pore Volume
B-9	Surface Area
B-10	Bulk Density
B-11	Crystallinity
B-12	Crystallite Size
B-13	Ignition Loss
B-14	Particle Density
B-15	Maximum Service Temperature
B-16	Attrition

Each table has been sorted and arranged in increasing numeric (or alphanumeric) order of the information in the first column of each table*. Numeric values of zero have not been printed, provided that the alphanumeric field is also blank. Hence, each of the B-tables presents all the information presently in the information store on each of the categories listed above. For example, Table B-12 shows that the crystallite size for only one material, out of the 360-odd materials catalogued, is known at present.

Appendix C contains six two-valued comparison tables:

Table	Numeric Values Compared
C-1	Pore volume, pore size
C-2	Surface area, pore size
C-3	Surface area, maximum temperature
C-4	Bulk density, particle density
C-5	Bulk density, attrition
C-6	Attrition, hardness

The C tables have been sorted in increasing numeric value of the property in the first column (excluding the material code). Zero values of this first property have been deleted and do not appear in the Tables. The column containing the second numeric value often contains many zero (blank) entries. These tables serve to indicate the extent to which both numeric property values are known at the present time.

---

* Not including the material-code column. Tables B-3 and B-4 have been sorted on material code.

As a result of the lack of more complete information, it is not known whether any empirical trends or correlations actually exist or might be developed.

Appendix E provides a listing of the material codes to permit identification of the manufacturer and the manufacturer's designation of the material. This Thesaurus also provides the address and telephone number at the main or home office of the manufacturer.

DISCUSSION

General Considerations

This survey has been motivated in part by the need to address the question: can one or more commercially-available catalyst, catalyst carrier, or sorbent materials be used to accomplish one or more desired physical or chemical changes that are important to the control of gaseous pollutant emissions from stationary sources? While a detailed answer to this question is probably not immediately available, the ongoing research and development activities of NAPCA might well be aided by even a partial answer to a related but much less difficult question: what kinds of commercially-available materials warrant further consideration for possible inclusion in testing programs, and what are some specific likely candidates?

These remarks differ only slightly insofar as each of the materials categories listed above might enter into a heterogenous process based in part on chemisorption. A catalyst carrier itself may be a sorbent, or may be catalytically active without further treatment. Sorbents also are used as carriers, and presumably might be made catalytically active in terms of some specific chemical reaction or reaction step.

The factors that determine the effectiveness of a particular catalyst in a particular situation are still obscure despite the expenditure of enormous amounts of R & D dollars. Development of a new catalyst tends to be frustrating, time consuming, and expensive. Attempts to apply available catalysts to systems other than those in which they have been proved effective might well be as difficult and as expensive as the development of completely new catalysts.

There is general agreement that the key to catalyst activity lies in the catalyst structure, both microscopic and macroscopic.(1, 2, 3, 4, 5, 6)*. The activity of a given catalyst or sorbent frequently depends on the precise method of preparation and activation, which may greatly influence the physical and chemical properties. The history of a solid material is important since the material may be exposed to chemical poisons, or may be rendered unusable as in the flaking caused by a highly exothermic reaction.

---

* References are given on page 11.

Practical Considerations

The above discussion indicates that there is presently no generalized theoretical framework for systematic selection of catalysts. Hence, simple practical knowledge must dominate any process of choosing catalyst candidates for further testing. The existing knowledge of past catalyst types serves as a guide.

Once the reaction type has been established, certain classes of catalysts can be chosen immediately on the basis of past successful applications to similar type reactions:(1,2)

	Catalyst	
Reaction	Type	Examples
Oxidation	metal oxide	V_2O_5, WO_3, Ag_2O, Fe_2O_3, NiO
Hydrogenation	metals	Ni, Pt, Pd, Fe, Cu, Ag
Dehydration	metal oxides	Al_2O_3, SiO_2, MgO, ThO_2
Cracking	acidic	SiO_2-Al_2O_3 (molecular sieves), H_3PO_4, H_2SO_4

Toro and Weinstein (8) suggest that the alkalized alumina material that has been used to date behaves primarily as a sorbent but also as a catalyst during the regeneration step. It is an oxidation catalyst with respect to the reducing gases H_2 and CO. One would guess on the basis of the tabulation above that such a catalyst would contain alumina (Al_2O_3), possibly an alkali or alkaline earth promoter or cocatalyst, and possibly some trace of a transition metal oxide such as Fe_2O_3. Since the material functions primarily as a sorbent in the slightly oxidizing atmosphere during exposure to the flue gas and sorption of the SO_2, the alumina substrate must be activated (must possess adsorption sites and a porous structure). Sulfur is recovered from the alkalized alumina (AA) process via the Claus oxidation of hydrogen sulfide and reduction of SO_2 over a natural or modified bauxite material. It is known that the AA sorbent does not possess sufficient physical stability to permit this process to compete economically with other SO_x control processes.

Physical Stability

Any approach to the evaluation of physical strength as a function of temperature and gaseous environment must be based in the main on practical knowledge and common sense. This information is generally not available from the printed material supplied by catalyst manufacturers. A material which is stable and possesses hardness and attrition resistance sufficient to withstand the required physical handling during processing at 300 F quite probably will be adequately stable in flue gas at 1500 F, provided that temperature changes occur slowly enough to avoid excessively high temperature gradients within the solid particles. The difficulty is that very few materials except the hard or dense aluminas seem to exhibit high hardness, crushing strength, and attrition resistance. These aluminas may be less useful as carriers, sorbents, or catalysts than the less physically hardy varieties of alumina and other materials, i.e., physical stability and catalytic or sorbent activity are frequently opposed. Rapid temperature cycling, often coupled with a high local rate of heat release (by chemical reaction), seems to present the biggest obstacle to long-term physical stability for those materials which are of interest from the standpoint of catalytic activity.

Chemical Stability

The chemical stability of the carrier materials such as the aluminas is not seriously in doubt in the temperature range 300-1500 F in mildly oxidizing and strongly reducing atmospheres. This says nothing about the stability of catalytic activity of catalysts prepared on otherwise stable carriers. The catalyst manufacturers supplied almost no direct information on this topic, nor is such information available elsewhere. Based on the remarks above regarding the strong influence of preparation and activation procedures on activity, it is not unreasonable to suggest that the question of chemical stability of catalyst activity can only be answered experimentally.

Cost Data

Manufacturers were most reluctant to supply cost information for this study. The costs reported here were obtained by telephone calls to persons at the management level (as distinct from sales personnel) in the company organizations, and cannot be considered formal quotations. In general, catalyst costs are subject to negotiation, and are sensitive to change in the price of raw materials, demand, supply and other factors. The available costs reported here were computed on the basis of dollars per ton in lots greater than 50 tons, F.O.B. the manufacturer's plant location.

Examples of the Use of this Survey

The catalog of catalysts, carriers, and sorbents provides a listing for comparison purposes of the material, its present uses, and approximate composition along with pertinent comments about its present use, cost, poisons, etc., as given in the 3 tables of Appendix A.

The sixteen tables included in Appendix B permit the user to gain some feel for the physical property data presently available from manufacturer-supplied sources. These B tables are also used for searching out materials which have some specific and desired physical property value or values.

The search for empirical trends in the physical behavior of selected materials is in large measure not yet complete, as a quick reference to the six tables of Appendix C will show. These comparisons require a higher level of completed information than has been achieved using the source information supplied by the manufacturers.

The information now included is sufficient to permit some preliminary searching. For example, material HS124 has a crushing strength of 100 lbs. as given in Table B-5. Material HS124 is a catalyst containing 75 percent sinc oxide, plus the oxides of aluminum, calcium, and chromium (Table A-1). This material is available in 1/4 x 1/4 inch tablets (Tables B-3 and B-4). It is presently being sold for use in the low-temperature desulfurization of gas streams. The BLITZ sheet on HS124 (Appendix F) shows:

pore volume = 0.12 cc/gm

bulk density = 112 lb/cu ft

There is no other information on HS124 entered in the data storage at the present time. Compared with the other materials in the data store, the pore volume of HS124 is low (Table B-8). The bulk density, however, is among the highest for those materials contained in the data store (Table B-10). For this particular material, none of the tables of Appendix C contain enough information to add significantly to an understanding of this material. Material HS124 may nevertheless warrant consideration for laboratory testing on the basis of the known crushing strength, bulk density and stated use, which suggests that sulfur is not a poison for this material. An inquiry into some of these possibilities could presumably be initiated on the basis of the information presently contained within the information system. From the Thesaurus (Appendix E) material HS124 is the ZN-0103T catalyst now being manufactured by the Harshaw Chemical Company.

From Table B-5, one can see that five other materials show crushing strengths equal to or greater than the 100 lb given for HS124: these are HS206, CC101, EP101, EP102, and HS114. On the basis of the information contained in Tables A-1 and Appendix F (BLITZ), HS114 and HS206 do not look very interesting. DP101, EP102, and CC101, however, are catalyst carriers which have possibly useful physical properties and therefore would warrant further consideration.

These examples of the use of the survey are examples of simple search procedures based on the user's knowledge of catalyst behavior and especially upon the user's knowledge of the requirements that must be met by some catalyst in a specific large-scale application. These simple search-and-compare procedures are carried out manually.

CONCLUSIONS AND RECOMMENDATIONS

The detailed information necessary for the evaluation or estimation of the physical strength of materials of interest is generally not given in the printed manufacturers' information used as a basis for this survey. Any approach to the evaluation of physical strength as a function of temperature and gaseous environment must be based on practical knowledge, past experience, and common sense. It is known that catalytic or sorbent activity and physical strength are frequently opposed. Rapid temperature cycling, which may be caused by high local rates of heat release by chemical reaction, is often cited as a major cause of loss of physical integrity.

At the present time it is feasible to select catalyst and sorbent materials from this survey only on the basis of probable physical stability in the required gaseous environments, and this only on a practical, common-sense basis. Chemical stability and catalytic activity cannot be determined or inferred from the information surveyed, with the exception that given materials are known to have been applied in specific process systems designed for the abatement of SO_x or NO_x emissions.

The catalyst catalog in its present form is useful in a general sense for data storage, data comparison, screening, and as a decision-making tool. The acquisition and assimilation of raw information into the system is, not surprisingly, the time-limiting operation. Nevertheless, this catalog in its present form and with its present contents, can be useful as a screening device.

This data store is capable of expansion within the logical structure and memory limits of computer systems now available at Battelle and elsewhere.

It is suggested and recommended that the program logic for some simple kinds of screening operations be constructed to facilitate the use of this catalog. This logic would supply the materials codes and other information for a material or materials, for example, which have a hardness greater than some specified value, and a surface area at least as great as 100 sq meters per gram, a pore volume in excess of 0.20 cc per gram, an active constituent based on the oxides of zinc and chromium, and a maximum service temperature greater than 1100 F. Such searches can be made automatic; they are done manually at the present time.

BIBLIOGRAPHY

1. DeMaio, Dennis, and A. Naglieri, "Catalyst Selection and Evaluation", Chemical Engineering, July 29, 1968, pp. 127-32.

2. Moss, R. L., "The Structure and Activity of Heterogeneous Catalysts", The Chemical Engineer (London), June, 1966, pp CE114-141.

3. Dowden, D. A., "Chemistry in the Design of Heterogeneous Catalysts," Chem. Eng. Progr. Symposium Series, No. 73, Vol. 63, 1967, pp. 90-104.

4. Satterfield, C. N., "Future Trends in Catalysis," Ind. Eng. Chem. vol. 61, no. 6, June, 1969, pp. 4-10.

5. Roberts, G. W., and C. N. Satterfield, "Effectiveness Factor for Porous Catalysts," Ind. Eng. Chem. Fundamentals, vol. 5, no. 3, August, 1966, pp. 317-24.

6. Knudsen, C. W., G. W. Roberts, and C. N. Satterfield, "Effect of Geometry on Catalyst Effectiveness Factor," ibid., pp. 325-6.

7. Adams, C. R., "Selectivity Effects in Some Catalytic Oxidation Processes," Ind. Eng. Chem., vol. 61, no. 6, June, 1969, pp. 30-8.

8. Toro, R. F., "Air Pollution Control Needs Spur Catalyst Sales," Environmental Science and Technology, vol. 3, no. 1, January, 1969, pp. 30-3.

9. Murphree Award Symposium on Catalytic Process Development, Ind. Eng. Chem., vol. 61, no. 7, July, 1969, pp. 5-35.

APPENDIX A

MULTIPLE-ENTRY MASTER TABLES FOR QUICK COMPARISONS

TABLE A-1. MASTER TABLE SORTED ON MATERIAL CODE

CODE	NAME AND CLASSIFICATION	COMPOSITION	MAJOR USES	MAJOR USES	COMMENTS	CODE
AC101	SOR. ACTIVATED ALUMINA	AL2O3 92%, NA2O 0.9%	DRYING GASES AND LIQUIDS	MAINTENANCE OF TRANSFORMER OIL		AC101
AC102	SOR. ACTIVATED ALUMINA	AL2O3 77%, NA2O 0.8% CACL2 9.3				AC102
AC103	SOR.ACTIVATED ALUMINA	AL2O3 88, NA2O .88, COCL2 2.0%	BREATHER EQUIP. + APPLIC. MFG.	VISIBLE IND. OF ADSORPTION		AC103
AC104	SOR. ALUMINA GEL	AL2O3 90, SIO2 2.2, NA2O 1.6%	DRYING GASSES UNDER HIGH PRESS	+ STATIC DRYING APPLICATIONS	NONTOXIC	AC104
AC301	CER. ALUMINA, CATALYTIC GRADE	MGO.AL2O3.SIO2	REFORMING,CRACKING			AC301
AC302	CAT. TABLETED ALUMINA	AL2O3 99.5%, SO3 .09, CAO .06%	LOW-SURFACE-AREA CATALYST	AGGREGATE(CASTABLE REFRACTORY)	AVAIL. AS CONVERTER DISCHARGE.	AC302
AC303	CAT. ACTIVATED ALUMINA	AL2O3 86%, NICKEL FORMATE 2.5%	CATALYST(PROD. OF CONTROLLED	ATMOS. IN HEAT-TREATING FURN.)	GRADE F-1 + NICKEL FORMATE	AC303
AL101	CER. HONEYCOMB, ALUMINA	ALUMINA 846 (ALSIMAG 614)	NOX FUME ABATEMENT	HCN REACTOR	SUPPLY ENGELHARD,DAV-CATALYST	AL101
AL102	CER. CORDIERITE	MGO.AL2O3.(5/2SIO2)	CARRIER IN HCN REACTOR	NOX FUME ABATEMENT EQUIPMENT		AL102
BC101	SOR. ACTIVATED CARBON	CARBON	REMOVES TOXIC GASES FROM AIR			HC101
CA102	CAT. NICKEL ON REFRACTORY	NIO 20-40%; REFRACTORIES-BAL.	MFG. NH3, STEAM REFORMING			CA102
CA103	CAT. IRON-CHROMIUM OXIDES	FE2O3 77-81%; CR2O3 9-11%	PRODUCE HYDROGEN			CA103
CA104	CAT. NICKEL OXIDE ON ALUMINA	NIO 30-70%; CARRIER BAL.	METHANATION			CA104
CA105	CAT. CU,ZN,AL OXIDES ON BASE	CU,ZN,AL OXIDES	PRODUCE HYDROGEN			CA105
CA201	CAT. VANADIA, K-PROMOTED	V2O5 9-10%, K2O 14-15%	H2SO4 CONTACT CATALYST			CA201
CA301	CAT. PALLADIUM ON ALUMINA	PALLADIUM 0.09-0.11%	HYDROGENATION		2-YEAR EXPECTED LIFE	CA301
CA302	CAT. PALLADIUM ON ALUMINA	PD 0.045-0.055%, AL2O3 BALANCE	HYDROGENATION		3-YEAR EXPECTED LIFE	CA302
CA303	CAT. PALLADIUM ON ALUMINA	PD 0.045-0.055%, AL2O3 BALANCE:	HYDROGENATION		3-YEAR EXPECTED LIFE	CA303
CA304	CAT. PALLADIUM ON SPECIAL CER.	NOT GIVEN	SELECTIVE HYDROGENATION		3-YEAR EXPECTED LIFE	CA304
CA305	CAT. NI,CO,CR ON ALUMINA	NI,CO,CR,ALUMINA	SELECTIVE HYDROGENATION		5-YEAR EXPECTED LIFE	CA305
CA306	CAT.COO, MOO ON ALUMINA	COO,MOO,ALUMINA	HYDROGENATION			CA306
CA401	CAT. METAL OXIDES ON NA-AL2O3	CO-MO OXIDE, NI-MO OXIDE	HYDROGENATION; HYDRODESULFURI-	ZATION; HYDRODENITRIFICATION	1 TO 5-YEAR EXPECTED LIFE	CA401
CA601	CAT. MIXED OXIDES	FE,K,CA,AL OXIDES	SYNTHESIS OF AMMONIA		1-2 YEARS STORAGE!	CA601
CA701	CAT. NICKEL OXIDE ON ALUMINA	NI 4-7%; AL2O3 BALANCE	STEAM-HYDROCARBON REFORMING			CA701
CA702	CAT. CHROMIUM OXIDE ON ALUMINA	CR 6-8%; AL2O3 BALANCE	STEAM-HYDROCARBON REFORMING			CA702
CA801	CAT. NOBLE METAL ON ALUMINA	NOT GIVEN	REMOVAL OF O2 FROM N2, NH3 AND	INERT GASES	SULFUR POISONS CATALYST	CA801
CC101	CER. ALUMINA, GAS REFORMING	AL2O3 99.5%, NA2O 0.45%	GAS REFORMING		RESISTANT TO STEAM AND H2	CC101
CC201	CER. CARBON-ON-ALUMINA	AL2O3 89%, CARBON 11%.				CC201
CC301	CER. ALUM. OXIDE,FUSED (WHITE)	AL2O3 88,SIO2 9,CAO 1,NA2O .52			MEDIUM POROSITY,COARSE GRANULE	CC301
CC302	CER. ALUM. OXIDE,FUSED (WHITE)	AL2O3 89,SIO2 9,CAO .6, NAO .5			MEDIUM POROSITY + PERMEABILITY	CC302
CC303	CER. ALUM. OXIDE,FUSED (WHITE)	AL2O3 88,SIO2 10.5, TIO2 .55			MED. POROSITY, TIGHT STRUCTURE	CC303
CC304	CER. ALUM. OXIDE,FUSED (WHITE)	AL2O3 84.5,SIO2 10.6,CAO .53			MED. POROSITY,TIGHT STRUCTURE	CC304
CC305	CER. ALUMINUM OXIDE, FUSED.	AL2O3 72,SIO2 23,TIO2 1.8			EXTRA-LOW POROSITY,TIGHT STRU.	CC305
CC306	CER. ALUMINUM OXIDE, FUSED.	AL2O3 85.5,SIO2 10.5,TIO2 1.8			LOW POROSITY, COARSE GRANULE	CC306
CC307	CER. ALUMINUM OXIDE, FUSED.	AL2O3 85,SIO2 11,TIO2 1.4			MEDIUM POROSITY,COARSE GRANULE	CC307
CC308	CER. ALUMINUM OXIDE, FUSED.	AL2O3 85.5,SIO2 10.5,TIO2 1.8			MEDIUM POROSITY + GRANULE	CC308
CC309	CER. ALUMINUM OXIDE, FUSED.	AL2O3 84,SIO2 11,TIO2 2.2			MEDIUM POROSITY,OPEN STRUCTURE	CC309
CC310	CER. ALUMINUM OXIDE, FUSED.	AL2O3 72,SIO2 22,TIO2 1.8			MED. POROSITY, TIGHT STRUCTURE	CC310
CC311	CER. SILICON CARBIDE	SIC 59,SIO2 27,AL2O3 11,NA2O 1			EXTRA-LOW POROSITY,TIGHT STRU.	CC311
CC312	CER. SILICON CARBIDE	SIC 78,SIO2 15,AL2O3 5.5			HIGH POROSITY, OPEN STRUCTURE	CC312
CC313	CER. SILICON CARBIDE	SIC 80,SIO2 14,AL2O3 4,NA2O .7			HIGH POROSITY, TIGHT STRUCTURE	CC313
CC314	CER. SILICON CARBIDE	SIC 80,SIO2 14,AL2O3 4,NA2O .7			LOW POROSITY, COARSE GRANULE	CC314
CC315	CER. SILICON CARBIDE	SIC 77.5,SIO2 15,AL2O3 5.5			LOW POROSITY, OPEN STRUCTURE	CC315
CC316	CER. SILICON CARBIDE	SIC 59,SIO2 26.5,AL2O3 11			LOW POROSITY, TIGHT STRUCTURE	CC316
CC317	CER. SILICON CARBIDE	SIC 78,SIO2 15,AL2O3 4,CAO 1			MED. POROSITY,COARSE STRUCTURE	CC317
CC318	CER. SILICON CARBIDE	AL2O3 4,SIC 78,SIO2 14,CAO 1.3			MEDIUM POROSITY + GRANULE SIZE	CC318
CC319	CER. SILICON CARBIDE	SIC 77,SIO2 16,AL2O3 6,K2O .55			MEDIUM POROSITY,OPEN STRUCTURE	CC319
CC320	CER. SILICON CARBIDE	SIC 59,SIO2 27,AL2O3 11,NA2O 1			MED. POROSITY, TIGHT STRUCTURE	CC320
CC321	CER. MULLITE	AL2O3 67,SIO2 30,CAO .7			LOW POROSITY,COARSE GRANULE	CC321
CC322	CER. MULLITE	AL2O3 68,SIO2 29,CAO 1,NAO .49			MED. POROSITY,COARSE GRANULE	CC322
CC323	CER. MULLITE	AL2O3 69,SIO2 30,NA2O .43			MED. POROSITY, TIGHT STRUCTURE	CC323
CC324	CER. ALUMINUM OXIDE (SINTERED)	AL2O3 88,SIO2 10,TIO2 .55			HIGH POROSITY, OPEN STRUCTURE	CC324
CC325	CER. ALUMINUM OXIDE (SINTERED)	AL2O3 96,SIO2 2.6,FE2O3 0.64			HIGH POROSITY, TIGHT STRUCTURE	CC325
CC326	CER. ALUMINUM OXIDE (SINTERED)	AL2O3 99.5,NA2O .45,FE2O3 .03			HIGH POROSITY, TIGHT STRUCTURE	CC326
CC327	CER. ALUMINUM OXIDE (SINTERED)	AL2O3 96,SIO2 2.6, FE2O3 .64			MED. POROSITY, TIGHT STRUCTURE	CC327
CC328	CER. SILICA	SIO2 93,AL2O3 6,BAO .6,MGO .33			HIGH POROSITY, TIGHT STRUCTURE	CC328
CC329	CER. SILICA	SIO2 94,NA2O 2.6,CAO 2,MGO .81			LOW POROSITY, COARSE GRANULE	CC329
CC330	CER. SILICA	SIO2 95,NA2O 3.4,AL2O3 .56			MED. POROSITY, COARSE GRANULE	CC330
CC331	CER. SILICA	SIO2 81,AL2O3 15,NA2O 1,K2O 1			MED. POROSITY, TIGHT STRUCTURE	CC331
CC332	CER. SILICA	SIO2 94,NA2O 4.5,CAO .59			MED. POROSITY, TIGHT STRUCTURE	CC332
CC333	CER. SILICA	SIO2 95,CAO 4.55,AL2O3 .23			MED. POROSITY, TIGHT STRUCTURE	CC333
CC334	CER. ZIRCON	ZRO2 60,SIO2 36,AL2O3 2,CAO .9			LOW POROSITY, COARSE GRANULE	CC334
CC335	CER. ZIRCON	ZRO2 54,SIO2 38,AL2O3 7,CAO .6			LOW POROSITY, TIGHT STRUCTURE	CC335
CC336	CER. ZIRCONIA	ZRO2 93,CAO 5,SIO2 .5,AL2O3 .5			MED. POROSITY, TIGHT STRUCTURE	CC336
CC337	CER. ALUMINUM OXIDE (SINTERED)	AL2O3 96,SIO2 2.6,FE2O3 .64			EXTRA-HIGH POROSITY,FINE PORE	CC337
CC338	CER. ALUMINUM OXIDE (SINTERED)	AL2O3 96,SIO2 2.6,FE2O3 .64			EXTRA-HIGH POROSITY, FINE PORE	CC338
CC339	CER. ALUMINUM OXIDE (SINTERED)	AL2O3 96,SIO2 1.3,CAO 1.2			EXTRA-HIGH POROSITY, FINE PORE	CC339
CC340	CER. ALUMINUM OXIDE (SINTERED)	AL2O3 99,NA2O .5,FE2O3 .06			EXTRA-HIGH POROSITY, FINE PORE	CC340
CC341	CER. ALUMINUM OXIDE (SINTERED)	AL2O3 82,SIO2 9.5,MGO 3,NAO 2			EXTRA-HIGH POROSITY, FINE PORE	CC341
CC342	CER. ALUMINUM OXIDE (SINTERED)	AL2O3 99.8,SIO2 .08,FE2O3 .04			EXTRA-HIGH POROSITY, FINE PORE	CC342

TABLE A-1. (Continued)

CY101	CAT. MOLECULAR SIEVE	SIO2 86.AL2O3 14. FE .5	CRACKING			CY101
CY102	CAT. MOLECULAR SIEVE	SIO2 74.AL2O3 26.FE .05	CRACKING			CY102
CY103	CAT. MOLECULAR SIEVE	SIO2 74.4%; AL2O3 25%; FE .04%	CRACKING			CY103
CY104	CAT. MOLECULAR SIEVE	SIO2 66. AL2O3 34. FE .12	CRACKING			CY104
CY105	CAT. MOLECULAR SIEVE	AL2O3 14%. FE .05%. NA2O .02%	FLUID CRACKING			CY105
CY201	CAT. MOLECULAR SIEVE	SIO2 85. AL2O3 15. SO4 .3	CRACKING		SUR. AREA DEC. BY STEAM 1070F	CY201
CY302	CAT. NI-MO	MO(O)3 15%; NIO 3.1%;	HYDROGENATION; DESULFURIZATION		SUBSTRATE NOT SPECIFIED	CY302
CY401	CAT. PLATINUM	PT-AS SPECIFIED; FE .025%	REFORMING NAPHTHAS		COST DEPENDS ON PT CONTENT	CY401
CY501	CAT. VANADIA-SILICA	V2O5 6.1. K2O 19.8. SIO2 62.	MFG OF PHTHALIC ANHYDRIDE			CY501
CY601	CAT. VANADIA. SULFURIC ACID	V2O5 9.1%. K2O 10.1%; FE .45%	CONTACT SULFURIC ACID PROCESS		SUBSTRATE NOT SPECIFIED	CY601
CY701	CAT. COBALT-MOLYBDENA CATALYST	MOO3 15.7. COO 3.2. NA2O .02	DESULFURIZATION. HYDROGENATION	REDUCES S2 AND N2 IN PETROLEUM		CY701
CY702	CAT. COBALT-MOLYBDENA CATALYST	MOO3 15.7. COO 3.0. NA2O .02	DESULFURIZATION. HYDROGENATION	REDUCES S2 AND N2 IN PETROLEUM		CY702
DG101	SOR. SILICA GEL	SIO2 99.71%	AIR AND GAS DRYING			DG101
DG102	SOR. SILICA GEL	SIO2 99.7. AL2O3 .10. TIO2 .09	AIR AND GAS DRYING	POSSIBLE CATALYST OR CARRIER	ALSO USED IN LIQUIDS	DG102
DG103	SOR. SILICA GEL	SIO2 99.7. AL2O3 .10. TIO2 .09	AIR AND GAS DRYING	POSSIBLE CATALYST OR CARRIER	ALSO USED IN LIQUIDS	DG103
DG104	SOR.SILICA GEL	SIO2 99.7. AL2O3 .10. TIO2 .09	AIR AND GAS DRYING	POSSIBLE CATALYST OR CARRIER	VERY LIMITED USES IN LIQUIDS	DG104
DG105	SOR. SILICA GEL	SIO2 99.7. AL2O3 .10. TIO2 .09	AIR AND GAS DRYING	USED AS CAT IN LIQ PROCESSES		DG105
DG106	SOR. SILICA GEL	SIO2 99.7. AL2O3 .10. TIO2 .09	AIR AND GAS DRYING	WIDELY USED AS SOR WITH LIQS	SOME USE AS CAT IN LIQ PROCESS	DG106
DG107	SOR. SILICA GEL	SIO2 99.7. AL2O3 .10. TIO2 .09	AIR AND GAS DRYING	LIMITED USE WITH LIQUIDS	POSSIBLE USE AS CATALYST	DG107
DG108	SOR. SILICA GEL	SIO2 99.7. AL2O3 .10. TIO2 .09	AIR AND GAS DRYING	POSSIBLE CATALYST OR CARRIER		DG108
DG109	SOR. SILICA GEL	SIO2 99.7. AL2O3 .10. TIO2 .09	SELECTIVE ADSORPTION- USED FOR	LIQUID OR GAS PHASE SEPARATION		DG109
DG110	SOR. SILICA GEL	SIO2 99.7. AL2O3 .10. TIO2 .09	SELECTIVE ADSORPTION- USED FOR	LIQUID OR GAS PHASE SEPARATION		DG110
DG111	SOR. SILICA GEL	SIO2 99.7. AL2O3 .10. TIO2 .09	SELECTIVE ADSORPTION- USED FOR	LIQUID OR GAS PHASE SEPARATION		DG111
DG112	SOR. SILICA GEL	SIO2 99.7. AL2O3 .10. TIO2 .09	SELECTIVE ADSORPTION- USED FOR	LIQUID OR GAS PHASE SEPARATION		DG112
DG113	SOR. SILICA GEL	SIO2 99.7. AL2O3 .10. TIO2 .09	SELECTIVE ADSORPTION- USED FOR	LIQUID OR GAS PHASE SEPARATION		DG113
DG114	SOR. SILICA GEL	SIO2 99.7. AL2O3 .10. TIO2 .09	SELECTIVE ADSORPTION- USED FOR	LIQUID OR GAS PHASE SEPARATION		DG114
DG115	SOR. SILICA GEL	SIO2 99.7. AL2O3 .10. TIO2 .09	SELECTIVE ADSORPTION- USED FOR	LIQUID OR GAS PHASE SEPARATION		DG115
DG116	SOR. SILICA GEL	SIO2 99.7. AL2O3 .10. TIO2 .09	SELECTIVE ADSORPTION- USED FOR	LIQUID OR GAS PHASE SEPARATION		DG116
DG117	SOR. SILICA GEL	SIO2 99.7. AL2O3 .10 TIO2 .09	DESSICANT		COLORED LT. BROWN	DG117
DG118	SOR. SILICA GEL	SIO2 99.7. AL2O3 .10. TIO2 .09	SOURCE OF SIO2 IN CHEM REAX	ANTI-CAKING AGENT		DG118
DG119	SOR. SILICA GEL	SIO2 99.7. AL2O3 .10. TIO2 .09	INDICATING DESICCANT		CHNGES COLOR AS HUMIDITY CHNGS	DG119
DG120	SOR. SILICA GEL	SIO2 99.7. AL2O3 .10. TIO2 .09	INDICATING DESICCANT			DG120
DG121	SOR. SILICA GEL	SIO2 99.7. AL2O3 .10. TIO2 .09	INDICATING DESICCANT			DG121
DG122	SOR. SILICA GEL	SIO2 99.7. AL2O3 .10. TIO2 .09	INDICATING DESICCANT			DG122
DG123	SOR. SILICA GEL	SIO2 99.7. AL2O3 .10. TIO2 .09	DESICCANT		VERY POROUS	DG123
DG124	SOR. SILICA GEL	SIO2 99.7. AL2O3 .10. TIO2 .09	ANTI-CAKING AGENT			DG124
DG125	SOR. SILICA GEL	SIO2 99.7. AL2O3 .10. TIO2 .09	DESICCANT. POSSIBLE USE AS CAR	OR AS SELECTIVE ADSORBANT		DG125
DG126	SOR. SILICA GEL	SIO2 99.7. AL2O3 .10. TIO2 .09	USED TO INTRODUCE H2O TO SYSTM			DG126
DG127	SOR. SILICA GEL	SIO2 99.7. AL2O3 .10. TIO2 .09	CHROMATOGRAPHIC SEPARATION			DG127
DG201	CRR. SILICA-ALUMINA.ZEOLITE	AL2O3 31. SIO2 69. SO4 0.4			ATTRITION RESIST. IN FLUID BED	DG201
DG202	CRR. SILICA-ALUMINA. ZEOLITE	SIO2 87. AL2O3 13	DEHYDRATION REACTIONS			DG202
DG203	CRR. SILICA GEL	SIO2 99.7.FE .03.NA2O .02	CARRIER / SUPPORT FOR CATALYST	USED IN THE CHEMICAL INDUSTRY.		DG203
DG204	CRR. SILICA GEL	SIO2 99.5. NA2O .09. FE .02	CARRIER / SUPPORT FOR CATALYST	USED IN THE CHEMICAL INDUSTRY.		DG204
DG205	CRR. SILICA GEL	SIO2 99.6. FE .03. NA2O .02	CARRIER / SUPPORT FOR CATALYST	USED IN THE CHEMICAL INDUSTRY.		DG205
DG206	CRR. SILICA GEL	SIO2 99.5. FE .03. NA2O .02	CARRIER / SUPPORT FOR CATALYST	USED IN THE CHEMICAL INDUSTRY.		DG206
DG208	CRR. SILICA GEL	SIO2 99.5.FE .02.AL2O3 .20	CARRIER / SUPPORT FOR CATALYST	USED IN THE CHEMICAL INDUSTRY.		DG208
DG209	CRR. SILICA GEL	SIO2 99.5.NA2O .09.FE .02	CARRIER / SUPPORT FOR CATALYST	USED IN THE CHEMICAL INDUSTRY.		DG209
DG210	CAT. SILICA/MAGNESIA	SIO2 70%. MGO 30% (DRY BASIS)	ESTERIFICATION REACTIONS; GAS/	OIL CRACKING (SUPPORT CAT.).	ALSO AVAILABLE AS A FLUID.	DG210
DG211	CAT. SILICA/ALUMINA	SIO2 87. AL2O3 13. IMPURITY .3	REACTIONS REQ G AN ACID CATALY	ST (ALKYATION.ESTERIFICATION).	HIGH ACIDITY	DG211
DG212	CAT. PELLETED SILICA/ALUMINA	SIO2 87.AL2O3 13.FE2O3 .05	DEHYDRATION CATALYST			DG212
DG213	CAT. PELLETED SILICA/ALUMINA	SIO2 75.AL2O3 25.FE2O3 .05	DEHYDRATION CATALYST			DG213
DG301	SOR. MOLECULAR SIEVE	NOT GIVEN	DRYING UNSATURATED HYDROCARBON	(ETHYLENE.PROPYLENE.BUTADIENE)		DG301
DG302	SOR. MOLECULAR SIEVE	NOT GIVEN	REMOVAL OF H2S. CO2. + ETHYL	MERCAPTAN FROM NATURAL GAS.		DG302
DG303	SOR. MOLECULAR SIEVE	NOT GIVEN	DEHYDRATION OF MOST FLUIDS			DG303
DG304	SOR. MOLECULAR SIEVE	NOT GIVEN	REMOVAL OF CO2 + H2O FROM AIR.	+ H2S + MERCAPTAN FROM L.P.G.		DG304
DG305	SOR. MOLECULAR SIEVE	NOT GIVEN	REFRIGERATION SYSTEMS			DG305
DP101	CRR. ALUMINA HONEYCOMB. TORVEX	AL2O3 96%.MGAL2O4 3%.MULLITE 1	OXIDATION OF HYDROCARBON FUMES	REDUCTION NITROGEN OXIDE FUMES	STRONG. THERMALLY STABLE	DP101
DP102	CRR. MULLITE HONEYCOMB. TORVEX	MULLITE 55%.SIO2 30%.AL2O3 15%	OXIDATION OF HYDROCARBON FUMES	REDUCTION NITROGEN OXIDE FUMES	STRONG. THERMALLY STABLE	DP102
EN101	CAT. KAOLIN. CRACKING	SIO2 52.9%.AL2O3 45%.TIO2 1.7%	CRACKING		SUPERIOR. STEAM. THERMAL	EN101
EN201	CAT. ACTIVATED BAUXITE	AL2O3 72. FE2O3 12. SIO2 11	DESULFURIZATION OF PETROLEUM			EN201
EN202	SOR. ACTIVATED BAUXITE	AL2O3 78. SIO2 9. FE2O3 8.	FOR REFINING PETROLEUM PRODUCT	DECOLORIZES; DEODORIZES; DRIES		EN202
EN203	CRR. ACTIVATED BAUXITE	AL2O3 81.5. SIO2 10.5.TIO2 3.5			ALSO USED AS SORBANT. CATALYST	EN203
EN204	CRR. ACTIVATED BAUXITE	AL2O3 93.5. SIO2 2.5. TIO2 2.0	DEFLUORINATION MEDIUM		ALSO USED AS CATALYST	EN204
EN205	CAT. ACTIVATED BAUXITE	AL2O3 68. SIO2 4. TIO2 3	SULFUR RECOVERY UNITS			EN205
EN206	SOR. ACTIVATED BAUXITE	AL2O3 81.5. SIO2 10. TIO2 3.5	DESSICANT FOR HYDROCARBONS.H2S			EN206
EN207	SOR. ACTIVATED BAUXITE	NOT GIVEN	OVERCOME SOURING OF HYDROCBNS	DRYING HALOGENATED HYDROCBNS		EN207
EN208	CAT. REFORMING	AL2O3 61.5. FE2O3 3.5.TIO2 3.5	REFORMING CAT FOR GASOLINE AND	NAPTHAS		EN208
EP101	CRR. SILICA. DIATOMACEOUS	AL2O3 92%.AL2O3 5%.FE2O3 1.8%	CARRIER FREE FROM POISONS		FREE FROM CATALYTIC POISONS	EP101
EP102	CRR. SILICA. DIATOMACEOUS	SIO2 92. AL2O3 5. FE2O3 1.8	CATALYST SUPPORT			EP102
GR101	CAT. PLATINUM ON ALUMINA	AL2O3 96.9%. NI 3%. PT 0.1%	DECOMP. OF HNO3 PLANT TAIL GAS	NOX REACT O2.CO.HYDROCARBONS	SULFUR IS POISON	GR101
GR202	SOR. ACTIVATED CARBON	NOT GIVEN	DESULFURIZING GAS STREAMS	FIXED BED OPERATIONS		GR202
GR301	CAT. COBALT-MOLY ON AL2O3	NOT GIVEN	HYDRODESULFURIZATION	HYDRODENITRIFICATION	LIMITED DROPPING DISTANCE.2FT.	GR301
GR401	CAT. NICKEL	NI 15 TO 25% BALANCE-NOT GIVEN	PRODUCTION OF H2. NH3. CH3OH			GR401
GR402	CAT. NICKEL	NOT GIVEN	STEAM-HYDROCARBON REFORMING			GR402

TABLE A-1. (Continued)

GR403	CAT.	NICKEL ON ALUMINA	NOT GIVEN	STEAM-HYDROCARBON REFORMING			GR403
GR404	CAT.	CHROMIUM-IRON OXIDE	NOT GIVEN	WATER-GAS SHIFT REACTION	REMOVAL OF S2 FROM GAS STREAMS		GR404
GR405	CAT.	COPPER OXIDE-ALUMINA	CUO, AMOUNT NOT SPECIFIED	LOW TEMP. CO CONVERSION		POISONED BY S2, HALOGEN COMPS	GR405
GR406	CAT.	NICKEL	NI 32% BALANCE-NOT GIVEN	METHANATION REACTIONS			GR406
GR407	CAT.	NICKEL	NI 32% BALANCE-NOT GIVEN	METHANATION REACTIONS			GR407
GR409	CAT.	CO-MO ON ALUMINA	NOT GIVEN	HYDRODESULFURIZATION			GR409
GR411	CAT.	CHROMIA-ALUMINA	NOT GIVEN	REMOVAL OF S2 COMPDS FROM GAS			GR411
GR412	CAT.	IRON OXIDE	NOT GIVEN	REMOVAL OF S2 COMPDS FROM GAS			GR412
GR413	SOR.	ZINC OXIDE	NOT GIVEN	REMOVES H2S FROM GAS STREAMS			GR413
GR414	CAT.	CO-MO	NOT GIVEN	CONVERT S2 COMPDS TO H2S	HYDROGENATION OF OLEFINS		GR414
GR415	CAT.	PD ON REFRACTORY OXIDE	PD 0.05-0.4% REFRACT OXIDE-BAL	HYDROGENATION			GR415
GR416	CAT.	PD ON ACTIVATED ALUMINA	NOT GIVEN	REMOVAL OF O2 FROM H2 STREAMS			GR416
GR417	CAT.	PD ON ACTIVATED CARBON	NOT GIVEN	REMOVAL OF O2 FROM H2 STREAMS			GR417
GR419	CAT.	NI-CO PROMOTED	NOT GIVEN	SELECTIVE HYDROGENATION			GR419
GR420	CAT.	PALLADIUM ON ALUMINA	NOT GIVEN	SELECTIVE HYDROGENATION			GR420
GR421	CAT.	PALLADIUM ON ALUMINA	NOT GIVEN	SELECTIVE HYDROGENATION			GR421
GR422	CAT.	PALLADIUM ON ALUMINA	NOT GIVEN	SELECTIVE HYDROGENATION		POISONED BY SULFUR	GR422
GR424	CAT.	CO-MO	NOT GIVEN	SELECTIVE HYDROGENATION			GR424
GR425	CAT.	PROMOTED COBALT	CO 60% IN OXIDIZED FORM	PRODUCTION OF PRIMARY AMINES	HYDROGENATION		GR425
GR426	CAT.	CO ON REFRACTORY OXIDE	CO 33%, REFRACTORY OXIDE-BAL.	HYDROGENATION			GR426
GR427	CAT.	CO ON KIESELGUHR	NOT GIVEN	HYDROGENATION			GR427
GR428	CAT.	COPPER-CHROMITE	NOT GIVEN	MILD HYDROGENATION			GR428
GR429	CAT.	BA PROMOTED CU2CR2O4	NOT GIVEN				GR429
GR430	CAT.	NICKEL ON KIESELGUHR	NI 65%,BALANCE KIESELGUHR	HYDROGENATION			GR430
GR431	CAT.	NICKEL ON KIESELGUHR	NI 56%, ZR 2%	HYDROGENATION			GR431
GR432	CAT.	ZR PROMOTED NI	NI 33%, BALANCE-NOT GIVEN	HYDROGENATION			GR432
GR433	CAT.	PALLADIUM ON CARBON	PD 1 TO 10%, CARBON BALANCE	SLURRY-TYPE HYDROGENATION			GR433
GR434	CAT.	PALLADIUM ON CARBON	PD 1 TO 10%, CARBON BALANCE	SLURRY-TYPE HYDROGENATION		MANUFACTURING NOT EQ. TO GR433	GR434
GR435	CAT.	IRON OXIDE	NOT GIVEN	AMMONIA SYNTHESIS			GR435
GR436	CAT.	IRON OXIDE	NOT GIVEN	AMMONIA DISSOCIATION			GR436
GR437	CAT.	IRON OXIDE	NOT GIVEN	DEHYDROGENATION			GR437
GR438	CAT.	CR AND K PROMOTED IRON	NOT GIVEN	STYRENE PRODUCTION FROM ETHYL-	BENZENE; DEHYDROGEN.OF CUMENE		GR438
GR439	SOR.	ACTIVATED CARBON	NOT GIVEN	REMOVAL OF S2 COMPDS FROM GAS			GR439
GR440	CAT.	PALLADIUM ON SIO2-AL2O3	PD .05-.5,SIO2-AL2O3 BALANCE	HYDROGENATION			GR440
HC201	CAT.	CHROME-ALUMINA	CR2O3 17.5% MIN., AL2O3 BAL.	DEHYDROGENATION; HYDROCRACKING	AROMATIZATION		HC201
HC202	CAT.	COBALT-MOLYBDATE ON AL2O3	MO(O)3 14.6; CO(O) 3.2; AL2O3	DESULFURIZATION; HYDROGENATION		REGENERATES, STEAM-AIR	HC202
HC203	CRR.	ALUMINA, HARD	AL2O3 98.0% NA2O 0.1%	REFORMING, ISOMERIZATION	ALKYLATION, DEHYDRATION	TRUE DENSITY, SOLID 230	HC203
HC204	CAT.	MINERAL	SIO2 53%, AL2O3 45%			PROBABLY A NATURAL ZEOLITE	HC204
HC205	CAT.	KAOLIN	SIO2 53%, AL2O3 45% FE2O3 0.3%				HC205
HC206	CAT.	PALLADIUM ON CARBON	PD, 5-10, AS SPECIFIED	HYDROGENATION			HC206
HC207	CAT.	PLATINUM ON ALUMINA	PT 0.5%, AL2O3 BAL.	DEHYDROGENATION; HYDROGENATION	REFORMING; ISOMERIZATION	51 LBS./FT.3, LOADING DENSITY	HC207
HC208	CAT.	PLATINUM ON ALUMINA	PT 0.5%, AL2O3 BAL.				HC208
HC209	CAT.	SILICA-ALUMINA, SYNTHETIC	SIO2 87.3%; AL2O3 12.4	FIXED BED CRACKING;	ISOMERIZATION, ALSO CARRIER	REGENERABLE BY AIR	HC209
HS101	CRR.	ALUMINA CATALYST	AL2O3 99	DRYING AGENT, DEHYDRATION		ALUMINA IS ACTIVATED	HS101
HS102	CRR.	ALUMINA CATALYST	AL2O3 96	DRYING AGENT, DEHYDRATION		HIGH ACTIVITY ALUMINA CARRIER	HS102
HS103	CRR.	ALUMINA CATALYST	AL2O3 98			HIGH ACTIVITY ALUMINA CARRIER	HS103
HS104	CRR.	ALUMINA CATALYST	AL2O3 92, SIO2 6			HIGH ACTIVITY ALUMINA CARRIER	HS104
HS105	CRR.	ALUMINA CATALYST	AL2O3 97			HIGH ACTIVITY ALUMINA CARRIER	HS105
HS106	CAT.	COBALT OXIDE ON ALUMINA	COO 10, BALANCE ALUMINA	SYNTHESIS OF HYDROGEN SULFIDE			HS106
HS107	CAT.	COO, CUO ON ALUMINA	COO 5, CUO 5, BALANCE ALUMINA	HYDROGENATION, DECOMPOSITION		ACTIVATED ALUMINA CARRIER	HS107
HS108	CAT.	COO, MOO3 ON ALUMINA	COO 3, MOO3 9, BALANCE ALUMINA	HYDROCARBON DESULFURIZATION			HS108
HS109	CAT.	COO, MOO3 ON ALUMINA	COO 3, MOO3 12, BAL. AL2O3	HYDROCARBON DESULFURIZATION			HS109
HS110	CAT.	COO, MOO3 ON ALUMINA	COO 3, MOO3 9, BALANCE ALUMINA	HYDROCARBON DESULFURIZATION			HS110
HS111	CAT.	CHROME ALUMINA	CR2O3 12, MGO 2, BAL. ALUMINA	DEHYDROGENATION		ACTIVATED ALUMINA CARRIER	HS111
HS112	CAT.	CHROMIUM OXIDE ON ALUMINA	CR2O3 19, BALANCE ALUMINA	DEHYDROGENATION OF BUTANE		ACTIVATED ALUMINA CARRIER	HS112
HS113	CAT.	COPPER CHROMITE	CUO 37, CR2O3 52	HYDROGENATION			HS113
HS114	CAT.	CUO ON ALUMINA	CUO 5, BALANCE ALUMINA	REMOVE O2,CO,H2 -GAS STREAM		INERT ALUMINA CARRIER	HS114
HS115	CRR.	MAGNESIA	MGO 98				HS115
HS116	CAT.	IRON OXIDE ON ALUMINA	FE2O3 5, BALANCE ALUMINA	AMMONIA DECOMPOSITION		INERT ALUMINA CARRIER	HS116
HS117	CAT.	MOLYBDENUM SULFIDE	MOS2 44	DEHYDROGENATION, HYDROGENATION	DESULFURIZATION		HS117
HS118	CAT.	MNO2 ON ALUMINA	MNO2 19, BALANCE ALUMINA	OXIDATION		ACTIVATED ALUMINA CARRIER	HS118
HS119	CAT.	NICKEL OXIDE ON ALUMINA	NIO 32, BALANCE ALUMINA	HYDROGENATION		ACTIVE ALUMINA CARRIER	HS119
HS120	CAT.	NI,W, ON ALUMINA,SULFIDED	NI 4.5, W 9.5, S , BAL. AL2O3	HYDROGENATION, DENITROGENATION		MILDLY ACIDIC	HS120
HS121	CAT.	VANADIA ON SILICA-ALUMINA	V2O5 10, BAL. SILICA-ALUMINA	OXIDATION			HS121
HS122	CAT.	VANADIA ON ALUMINA	V2O5 10, BALANCE ALUMINA	OXIDATION		HIGH ACTIVITY ALUMINA CARRIER	HS122
HS123	CAT.	VANADIA ON ALUMINA	V2O5 10, BALANCE ALUMINA	OXIDATION		INERT ALUMINA CARRIER	HS123
HS124	CAT.	ZINC	ZNO 75, AL, MG, CA, CR OXIDES	DESULFURIZATION			HS124
HS125	CAT.	CHROMITE	ZNO 76, CR2O3 23	SYNTHESIZE METHANOL		CATALYST REQUIRES REDUCTION	HS125
HS126	CAT.	SILVER ON ALUMINA	AG 6.0 BALANCE AL2O3	OXIDATION OF METHANOL TO FORM-	ALDEHYDE		HS126
HS127	SOR.	ALUMINA	AL2O3 98%, BALANCE MOISTURE				HS127
HS128	SOR.	ALUMINA	AL2O3 98%, BALANCE MOISTURE				HS128
HS129	SOR.	ALUMINA	AL2O3 92%	CHROMATOGRAPHIC ADSORPTION			HS129
HS130	CRR.	ALUMINA	AL2O3 97%	FLUID BED OPERATIONS			HS130
HS131	CRR.	ALUMINA	AL2O3 92%, SIO2 6%				HS131
HS132	CAT.	BARIUM CHLORIDE ON CARBON	BACL2 27%, BALANCE CARBON	REMOVAL OF HCL2 FROM CHLORINE	CONTAINING HYDROCARBON		HS132
HS133	CAT.	COBALT OXIDE ON KIESELGUHR	COO 35%, BALANCE KIESELGUHR	HYDROGENATION CATALYST			HS133
HS134	CAT.	COBALT ON KIESELGUHR	CO 39% BALANCE KIESELGUHR	OXO PROCESS + RELATED HYDROGEN	ATION REACTIONS.		HS134

TABLE A-1. (Continued)

HS135	CAT. COBALT CATALYST	COO 13% ON SIO2 TYPE BASE	OXO SYNTHESIS PROCESS + HYDRO- GENATION REACTIONS.		HS135
HS136	CAT. COBALT CATALYST	COO 6% ON SIO2 TYPE BASE	OXO SYNTHESIS PROCESS + HYDRO- GENATION REACTIONS.		HS136
HS137	CAT. COBALT CATALYST	COO 20% ON SIO2 TYPE BASE	OXO PROCESS TO CONVERT ALDE- HYDES TO ALCOHOLS.		HS137
HS138	CAT. COBALT CATALYST	COO 10%, BAL. ACTIVATED AL203	HYDROGENATION CATALYST		HS138
HS139	CAT. COBALT CATALYST	COO 18%, BAL. ACTIVATED AL203			HS139
HS140	CAT. COBALT MOLYBDATE CATALYST	COO 3, MOO3 15, BALANCE AL203	DENITROGENATION + DESULFURIZA- TION OF HYDROCARBONS.		HS140
HS141	CAT. CHROME ALUMINA	CR203 12, BAL. ACTIVATED AL203	DEHYDROGENATION		HS141
HS142	CAT. CHROME ALUMINA	CR203 5%, BAL. ACTIVATED AL203	DEHYDROGENATION		HS142
HS143	CAT. CHROME ALUMINA	CR203 9%,K20 1.5%,BAL. AL203	DEHYDROGENATION		HS143
HS144	CAT. CHROME ALUMINA	CR203 33, BAL. SILICATED AL203			HS144
HS145	CAT. CHROME ALUMINA	CR203 19, BAL. ACTIVATED AL203	DEHYDROGENATION CATALYST FOR FLUID BED USE.		HS145
HS146	CAT. CHROME ALUMINA	CR203 19,BAL. ACTIVATED AL203	DEHYDROGENATION OF BUTANE TO BUTYLENE.		HS146
HS147	CAT. COPPER CHROMATE	CUO 82,CR203 17			HS147
HS148	CAT. COPPER CHROMITE	CUO 80, CR203 17		TABLETED CU-0202P (HS147)	HS148
HS149	CAT. COPPER CHROMITE	CR203 44, CUO 41, BAO 11			HS149
HS150	CAT. COPPER CHROMITE	CR203 38, CUO 36, BAO 10		TABLETED CU-0401P (HS149)	HS150
HS151	CAT. COPPER CHROMITE	CR203 43.5, CUO 39, BAO 10			HS151
HS152	CAT. COPPER CHROMITE	CR203 38, CUO 33, BAO 9.5		TABLETED CU-1106P (HS151)	HS152
HS153	CAT. COPPER CHROMITE	CR203 46, CUO 41, BAO 9			HS153
HS154	CAT. COPPER CHROMITE	CR203 60, CUO 40			HS154
HS156	CAT. COPPER CHROMITE	CUO 51, CR203 47			HS156
HS157	CAT. COPPER CHROMITE	CUO 42, CR203 38		TABLETED CU-1800P (HS156)	HS157
HS158	CAT. COPPER CHROMITE	CUO 54, CR203 41			HS158
HS159	CAT. COPPER	CUO 99%	REMOVE O2 + H2 FROM GAS STREAM		HS159
HS160	CAT. COPPER ON ALUMINA	CUO 10%, BAL. ACTIVATED AL203	REMOVAL OF TRACE AMOUNTS OF O2 FROM GAS STREAMS.		HS160
HS161	CAT. COPPER ON ALUMINA	CU 7.7%, BAL. ACTIVATED AL203	CHLORINATION		HS161
HS162	CAT. COPPER ON ALUMINA	CUCL2 10,BAL. ACTIVATED AL203P	CHLORINATION CATALYST		HS162
HS163	CAT. COPPER ON ALUMINA	CUCL2 10, BAL. ACTIVATED AL203	CHLORINATION CATALYST		HS163
HS164	CAT. COPPER	CUO 79%	CONVERT ALDEHYDES TO ALCOHOLS, REMOVE TRACE GASES (O2,CO,H2)		HS164
HS165	CAT. COPPER ON SILICA	CU2CO3 6%, BALANCE SIO2	DEHYDROGENATE ALCOHOLS TO ALDEHYDES OR KETONES..		HS165
HS166	CAT. IRON OXIDE ON ALUMINA	FE203 20, BAL. ACTIVATED AL203	DEHYDROGENATION CATALYST		HS166
HS167	CAT. IRON OXIDE ON ALUMINA	FE203 20, BAL. ACTIVATED AL203	FLUID-BED HYDROGENATION CAT.		HS167
HS171	CAT. MANGANESE OXIDE ON SILICA	MNO2 2%, BALANCE SIO2	OXIDATION CATALYST		HS171
HS173	CAT. MOLYBDENA ON ALUMINA	MOO3 10, BAL. ACTIVATED AL203	DEHYDROGENATION		HS173
HS174	CAT. MOLYBDENA ON ALUMINA	MOO3 11, BAL. ACTIVATED AL203	FLUID BED HYDROFORMING AND DE- HYDROGENATION.		HS174
HS175	CAT. MOLYBDENA ON ALUMINA	MOO3 10, BAL. ACTIVATED AL203	HYDRO + DEHYDROGENATION ,ALSO HYDROFORMING.		HS175
HS176	CAT. NICKEL HYDRATE,KIESELGUHR	NI 44(HYDRATE),BAL. KIESELGUHR	HYDROGENATION + METHANATION		HS176
HS177	CAT.NICKEL OXIDE ON KIESELGUHR	NIO 55, BALANCE KIESELGUHR	HYDROGENATION CATALYST	MUST BE REDUCED BEFORE USE	HS177
HS178	CAT. NICKEL ON KIESELGUHR	NI 60, BALANCE KIESELGUHR	HYDROGENATION CAT. FOR TRICKLE BED OR LIQUID PHASE REACTIONS.	NOT PYROPHORIC AS SHIPPED.	HS178
HS179	CAT. NICKEL ON KIESELGUHR	NI 58, BALANCE KIESELGUHR	HYDROGENATION CATALYST	NOT PYROPHORIC AS SHIPPED	HS179
HS180	CAT. NICKEL ON KIESELGUHR	NI 58, BAL. KIESELGUHR		TABLETED FORM OF NI-0104P	HS180
HS181	CAT. NICKEL ON KIESELGUHR	NI 56, BALANCE KIESELGUHR	HYDROGENATION CAT. (PARTIALLY REDUCED + STABILIZED)		HS181
HS182	CAT. NICKEL OXIDE, KIESELGUHR	NIO 66, BALANCE KIESELGUHR	HYDROGENATION CAT. (UNREDUCED)	MUST BE REDUCED BEFORE USE.	HS182
HS183	CAT. NICKEL ON KIESELGUHR	NI 30, BALANCE KIESELGUHR	FOR CERTAIN SPECIFIC PROBLEMS IN HARDENING SOME FATTY OILS.	CONSULT HARSHAW REP. + DETAILS	HS183
HS184	CAT. NICKEL ON KIESELGUHR	NI 60(REDUCED),BAL. KIESELGUHR	HYDROGENATION CATALYST	PYROPHORIC,SHIPPED IN LIQUID.	HS184
HS185	CAT. NICKEL ON KIESELGUHR	NI 60, BAL. KIESELGUHR	HYDROGENATION CAT.(HIGH PHYSI- CAL STRENGTH).	NOT PYROPHORIC AS SHIPPED	HS185
HS186	CAT. NICKEL ON KIESELGUHR	NI 28, BALANCE KIESELGUHR	HYDROGENATION CAT. (ACTIVE BUT STABLE).	NOT PYROPHORIC AS SHIPPED	HS186
HS187	CAT. NICKEL OXIDE ON ALUMINA	NIO 11, BAL. ACTIVATED AL203	HYDROGENATION OF DIOLEFINS TO MONO-OLEFINS (SULFIDED FORM).		HS187
HS188	CAT. NICKEL OXIDE ON ALUMINA	NIO 15, BAL. ACTIVATED AL203	HYDROGENATION		HS188
HS189	CAT. NICKEL ON KIESELGUHR	NI 26 (REDUCED),BAL.,KIESELGUHR	HYDROGENATION REACTIONS		HS189
HS190	CAT. NICKEL OXIDE, KIESELGUHR	NIO 18, BALANCE KIESELGUHR	HYDROGENATION REACTIONS		HS190
HS191	CAT. NICKEL OXIDE ON ALUMINA	NIO 14, BAL. ACTIVATED AL203	HYDROGENATIONS + AMINATIONS.		HS191
HS192	CAT.NICKEL OXIDE ON ALUMINA	NIO 5,BAL. AL203-SIO2 (INERT)	REFORM LOW MOLECULAR WEIGHT HYDROCARBONS.		HS192
HS193	CAT. NICKEL OXIDE ON ALUMINA	NIO 10,BAL. AL203-SIO2 (INERT)	REFORM LOW MOLECULAR WEIGHT HYDROCARBONS.		HS193
HS194	CAT. NICKEL OXIDE ON ALUMINA	NIO2 5, BALANCE AL203 (INERT)	GAS REFORMING CATALYST		HS194
HS195	CAT. NICKEL OXIDE ON ALUMINA	NIO 1.5,BAL. AL203-SIO2(INERT)	USED IN GAS REFORMING		HS195
HS196	CAT. NICKEL,ALUMINUM	NI 50%, AL 50%	PROCESS HYDROGENATIONS IN LOW TO MODERATE TEMPERATURE RANGES	SUPPLIED INACTIVE	HS196
HS197	CAT. NICKEL CATALYST	NI 70%, BASE MAT.L PROPRIETARY	HYDROGENATION CATALYST	NOT PYROPHORIC AS SHIPPED	HS197
HS198	CAT. NICKEL CATALYST	NI 66%, BASE MAT L PROPRIETARY	HYDROGENATION CATALYST	ACTIVATE (REDUCTION)IN SITU	HS198
HS199	CAT. NICKEL ON ALUMINA	NI 40%, BAL. ACTIVATED AL203	HYDROGENATION CATALYST	NOT PYROPHORIC AS SHIPPED	HS199
HS200	CAT. NICKEL OXIDE ON ALUMINA	NIO 5, MG 1.2, BAL. AL203-SIO2	A GAS REFORMING CATALYST		HS200
HS201	CAT. METAL OXIDES ON ALUMINA	NIO 4,FE203 4,COO 4,AL203-SIO2	DECOMPOSITION CATALYST		HS201
HS202	CAT. METAL OXIDES ON ALUMINA	NIO 4,FE203 4,COO 4,AL203-SIO2	A DECOMPOSITION CATALYST		HS202
HS203	CAT. METAL OXIDES ON SILICA	NIO 10,CUO 1,BAL SIO2	HYDROGENATION CATALYST		HS203
HS204	CAT. NICKEL OXIDE ON ALUMINA	NIO 3, BAL. ACTIVATED AL203	A GAS REFORMING CATALYST		HS204
HS205	CAT. NICKEL	NIO 5, BAL. INERT CUBES	GAS REFORMING CATALYST		HS205
HS206	CAT. NICKEL-ALUMINUM	NI 49%, AL 49%	FOR FIXED BED,LOW-MODERATE TEMP. HYDROGENATION REACTIONS.	MUST BE ACTIVATED IN SITU.	HS206
HS207	CAT. (NYSEL)	NI 30(ACTIVE)BASE PROPRIETARY	SUPERIOR SELECTIVITY IN THE HYDROGENATION OF EDIBLE OILS.	CONSULT HARSHAW REP.,DETAILS	HS207
HS208	CAT. NICKEL FLAKES (RUFERT)	NI 25% (NO OTHER DATA GIVEN)	HYDROGENATION OF FATTY OILS + ACIDS,METHYL ESTERS, ETC.		HS208
HS209	CAT. NICKEL/TUNGSTEN	NI 6,W 19,BAL. SIO2/AL203	SULFIDE FORM-CRACKING FUNCTION DE-NITROGENATION/SULFURIZATION		HS209
HS210	CAT. NICKEL/TUNGSTEN SULFIDE	NOT GIVEN (SEE COMMENTS)		SULFIDED FORM OF HS209	HS210
HS211	CAT. NICKEL/TUNGSTEN SULFIDE	NOT GIVEN (SEE COMMENTS)		SULFIDED FORM OF HS212	HS211
HS212	CAT.NICKEL/TUNGSTEN ON ALUMINA	NI 6,W 19, BALANCE AL203	DE-NITROGENATION/SULFURIZATION ,SATURATION AROMATIC COMPOUNDS		HS212

TABLE A-1. (Continued)

HS5213	CAT.NICKEL/TUNGSTEN ON ALUMINA	NI 4.5,W 9.5, BALANCE AL2O3	DE-NITROGENATION/SULFURIZATION .SATURATION AROMATIC COMPOUNDS	MILDLY ACIDIC	HS5213
HS5214	CAT. PALLADIUM ON ALUMINA	PD 0.3%, BAL. ACTIVATED AL2O3	HYDROGENATION CATALYST		HS5214
HS5215	CAT. PALLADIUM ON ALUMINA	PD 0.3%, BAL. ACTIVATED AL2O3	HYDROGENATION CATALYST	PD ACTIVATED + STABILIZED	HS5215
HS5216	CAT. PALLADIUM CATALYST	PD 0.3,BASE MAT L PROPRIETARY	HYDROGENATION CATALYST(STABLE)		HS5216
HS5217	CAT. TITANIA ON ALUMINA	TIO2 86%, BALANCE AL2O3			HS5217
HS5218	CAT. VANADIUM OXIDE ON ALUMINA	V2O5 10, BAL. ACTIVATED AL2O3	OXIDATION		HS5218
HS5219	CAT. VANADIUM OXIDE ON ALUMINA	V2O5 10, BALANCE AL2O3	OXIDATION		HS5219
HS5220	CAT. METAL OXIDES ON ALUMINA	V2O5 5, MOO3 5, ON INERT AL2O3	OXIDATION CATALYST		HS5220
HS5221	CAT. METAL OXIDES ON ALUMINA	V2O5 6, MOO3 3, ON INERT AL2O3	OXIDATION CATALYST		HS5221
HS5222	CAT. TUNGSTEN OXIDE ON ALUMINA	WO3 10, BAL. ACTIVATED AL2O3			HS5222
HS5223	CAT. TUNGSTEN OXIDE	WO3 95% (APPROX.)	DEHYDRATION	SHOULD BE REDUCED BEFORE USE.	HS5223
HS5224	CAT. TUNGSTEN OXIDE ON ALUMINA	WO3 10, BAL. ACTIVATED AL2O3	DEHYDRATION		HS5224
HS5225	CAT. CHROMITE	NOT GIVEN (SEE COMMENTS)	READY AS SHIPPED FOR METHANOL SYNTHESIS.	REDUCED FORM OF HS125	HS5225
HS5226	CAT. CHROMITE	NOT GIVEN (SEE COMMENTS)		SIMILAR TO HS125	HS5226
HS5227	CAT. CHROMITE	NOT GIVEN (SEE COMMENTS)		SIMILAR TO HS225	HS5227
HS5228	CAT. ZINC OXIDE	ZNO 100%	REMOVAL OF SULFUR FROM GAS STREAMS.		HS5228
HS5229	CAT. METAL OXIDES ON ALUMINA	ZNO 38,CR2O3 25,/BALANCE AL2O3			HS5229
HS5230	CAT. METAL OXIDES ON ALUMINA	ZNO 10,CR2O3 10, BAL. AL2O3			HS5230
HS5231	CAT. ZINC OXIDE ON ALUMINA	ZNO 24 ,BAL. ACTIVATED AL2O3			HS5231
HS5232	CAT. ZINC ACETATE	ZN(C2H3O2)2 10%, BAL. CARBON	CONVERT ACETYLENE AND ACETIC ACID TO VINYL ACETATE MONOMER		HS5232
HS5233	CAT. ZIRCONIA	ZRO2 98%, BALANCE AL2O3			HS5233
HS5234	CAT. ALUMINA	AL2O3 91%, SIO2 6%	CATALYST SUPPORT		HS5234
KC101	COR. ACTIVATED ALUMINA	AL2O3 93.6%, NA2O 0.30%			KC101
MA101	CAT. PLATINUM ON TORVEX	NOT GIVEN	NOX, HYDROCARBON FUME REMOVAL	SEE DP101 AND DP102 FOR TORVEX	MA101
MN101	CAT. VANADIUM OXIDE	V2O5,CARRIER NOT SPECIFIED	H2SO4 CONTACT CATALYST	IMMUNE TO COMMON POISONS	MN101
MN102	CAT. VANADIUM OXIDE	V2O5,CARRIER NOT SPECIFIED	H2SO4 CONTACT CATALYST	FOR HIGH SO3 CONCENTRATIONS	MN102
MN103	CAT. VANADIUM OXIDE	V2O5,CARRIER NOT SPECIFIED	H2SO4 CONTACT CATALYST	RUGGED IN FIXED-BED OPERATION	MN103
NC101	COR. ZEOLITE, SYNTHETIC	NOT GIVEN	ALKYLATION AND ISOMERIZATION DRY REFORMER RECYCLE HYDROGEN		NC101
NL101	CAT. SYNTHETIC SIO2-AL2O3 TYPE	AL2O3 13, SO4 0.4, BAL. SIO2	FLUID CRACKING		NL101
NL102	CAT. SYNTHETIC SIO2-AL2O3 TYPE	AL2O3 25, SO4 0.4, BAL. SIO2	FLUID CRACKING		NL102
NL103	CAT. MODIFIED SYNTHETIC TYPE	AL2O3 33, SO4 0.4, BAL. SIO2	FLUID CRACKING		NL103
NL104	CAT. MODIFIED SYNTHETIC TYPE	AL2O3 29, SO4 0.4, BAL. SIO2	FLUID CRACKING		NL104
NL105	CAT. MOLECULAR SIEVE TYPE	AL2O3 32, SO4 0.4, BAL. SIO2	FLUID CRACKING		NL105
NL106	CAT. MOLECULAR SIEVE TYPE	AL2O3 32, SO4 0.4, BAL. SIO2	FLUID CRACKING		NL106
NL107	CAT. MO, CO, OXIDES ON ALUMINA	MOO3 12.5, COO 3.5	HYDRODESULFURIZATION		NL107
NL108	CAT. MO, CO, OXIDES ON ALUMINA	MOO3 12.5, COO 3.5	HYDRODESULFURIZATION		NL108
NL109	CAT. NI ON SIO2-AL2O3	MOO3 13, NI 4.5, SIO2 15	DESULFURIZATION		NL109
NL110	CAT. MO, NI ON ALUMINA	MOO3 14, NIO 2.8, SIO2 1.5	DESULFURIZATION		NL110
NL111	CAT. NICKEL-TUNGSTEN	W 14, NI 4, SO4 0.4 BAL. AL2O3	SPECIFIC HYDROTREATING		NL111
NL112	COR. ALUMINA BASE	ALUMINA			NL112
NL113	CAT. SILICA-ALUMINA	AL2O3 33, NA2O .09, SIO2-BAL.	FLUID CRACKING		NL113
BM101	COR. ALUMINA	AL2O3 92.2,NA2O .5,SIO2 .10			BM101
UA101	CAT. POROUS CERAMIC	NOT GIVEN	OXIDATION OF SO2, HYDROCARBONS AT LOW TEMPERATURE	MFGR CAN SUPPLY MORE INFO.	UA101
UA102	CAT. POROUS CERAMIC	NOT GIVEN	OXIDATION OF HYDROGEN (LOW T)	MFGR CAN SUPPLY MORE INFO.	UA102
UA103	CAT. METAL ON METAL	NI 60%, CR 20%, FE 20%	COMBUSTION HYDROCARBON FUMES	OK IN REDUCING ATMOSPHERES	UA103
UC101	SOR. MOLECULAR SIEVE	NOT GIVEN	REMOVES SO2 AND OXIDES OF N2 FROM PROCESS STREAMS		UC101
UC102	SOR. MOLECULAR SIEVE	NOT GIVEN	REMOVES SO2 AND OXIDES OF N2 FROM STREAMS; DRIES SOUR GAS		UC102
UC201	SOR. MOLECULAR SIEVE	NOT GIVEN	SEPARATES NORMAL FROM BRANCHED PARAFFINS		UC201
UC202	SOR. MOLECULAR SIEVE	NOT GIVEN	REMOVES H2O, CO2, H2S FROM GAS		UC202
UC203	SOR. MOLECULAR SIEVE	NOT GIVEN	DEHYDRATION		UC203
UC204	SOR. MOLECULAR SIEVE	NOT GIVEN	DEHYDRATION; DESSICANT		UC204
UC301	CAT. PALLADIUM ON MOL. SIEVE	PD 0.5	PENTANE-HEXANE ISOMERIZATION		UC301
UC302	CAT. PALLADIUM ON MOL. SIEVE	PD 0.5	BUTANE ISOMERIZATION		UC302
UC303	CAT. PLATINUM ON MOL. SIEVE	PT 0.5	REFORMING		UC303
UC304	CAT. PALLADIUM ON MOL. SIEVE	PD 0.5	HYDROGENATION		UC304
UC305	CAT. PALLADIUM ON MOL. SIEVE	PD 0.5	HYDROGENATION		UC305
UC306	CAT. NICKEL ON MOLECULAR SIEVE	NI 1.0	HYDRODEALKYLATION		UC306
UC307	CAT. COPPER ON MOLECULAR SIEVE	CU 1.0	HYDRODEALKYLATION		UC307
UC401					UC401
UC402	CAT. MOLECULAR SIEVE	NOT GIVEN	ALKYLATION		UC402
UC501	CAT. MOLECULAR SIEVE	NOT GIVEN	ISOMERIZATION PENTANE+HEXANE		UC501
XY101	CAT. PLATINUM ON ALUMINA COMM	NOT GIVEN	NOX FUMES, HNO3 TAILS GASES	SIMILAR TORVEX DP101	XY101

TABLE A-2. MASTER TABLE SORTED ON CLASSIFICATION

CODE	NAME AND CLASSIFICATION	COMPOSITION	MAJOR USES	MAJOR USES	COMMENTS	CODE
HS132	CAT.BARIUM CHLORIDE ON CARBON	BACL2 27%, BALANCE CARBON	REMOVAL OF HCL2 FROM CHLORINE	CONTAINING HYDROCARBON		HS132
HS133	CAT.COBALT OXIDE ON KIESELGUHR	COO 35%, BALANCE KIESELGUHR	HYDROGENATION CATALYST			HS133
CA306	CAT.COO, MOO ON ALUMINA	COO,MOO,ALUMINA	HYDROGENATION			CA306
GR428	CAT.COPPER-CHROMITE	NOT GIVEN	MILD HYDROGENATION			GR428
HS212	CAT.NICKEL/TUNGSTEN ON ALUMINA	NI 6,W 19, BALANCE AL2O3	DE-NITROGENATION/SULFURIZATION	,SATURATION AROMATIC COMPOUNDS		HS212
HS213	CAT.NICKEL/TUNGSTEN ON ALUMINA	NI 4.5,W 9.5, BALANCE AL2O3	DE-NITROGENATION/SULFURIZATION	,SATURATION AROMATIC COMPOUNDS	MILDLY ACIDIC	HS213
HS192	CAT.NICKEL OXIDE ON ALUMINA	NIO 5,BAL. AL2O3-SIO2 (INERT)	REFORM LOW MOLECULAR WEIGHT	HYDROCARBONS.		HS192
HS177	CAT.NICKEL OXIDE ON KIESELGUHR	NIO 55, BALANCE KIESELGUHR	HYDROGENATION CATALYST		MUST BE REDUCED BEFORE USE	HS177
EN205	CAT. ACTIVATED BAUXITE	AL2O3 88, SIO2 4, TIO2 3	SULFUR RECOVERY UNITS			EN205
EN201	CAT. ACTIVATED BAUXITE	AL2O3 72, FE2O3 12, SIO2 11	DESULFURIZATION OF PETROLEUM			EN201
HS234	CAT. ALUMINA	AL2O3 91%, SIO2 6%	CATALYST SUPPORT			HS234
GR429	CAT. BA PROMOTED CU2CR2O4	NOT GIVEN				GR429
HC201	CAT. CHROME-ALUMINA	CR2O3 17.5% MIN., AL2O3 BAL.	DEHYDROGENATION; HYDROCRACKING	AROMATIZATION		HC201
HS145	CAT. CHROME ALUMINA	CR2O3 19, BAL. ACTIVATED AL2O3	DEHYDROGENATION CATALYST FOR	FLUID BED USE.		HS145
HS146	CAT. CHROME ALUMINA	CR2O3 19,BAL. ACTIVATED AL2O3	DEHYDROGENATION OF BUTANE TO	BUTYLENE.		HS146
HS111	CAT. CHROME ALUMINA	CR2O3 12, MGO 2, BAL. ALUMINA	DEHYDROGENATION		ACTIVATED ALUMINA CARRIER	HS111
HS141	CAT. CHROME ALUMINA	CR2O3 12, BAL. ACTIVATED AL2O3	DEHYDROGENATION			HS141
HS142	CAT. CHROME ALUMINA	CR2O3 5%, BAL. ACTIVATED AL2O3	DEHYDROGENATION			HS142
HS143	CAT. CHROME ALUMINA	CR2O3 9%,K2O 1.5%,BAL. AL2O3	DEHYDOGENATION			HS143
HS144	CAT. CHROME ALUMINA	CR2O3 33, BAL. SILICATED AL2O3				HS144
GR411	CAT. CHROMIA-ALUMINA	NOT GIVEN	REMOVAL OF S2 COMPDS FROM GAS			GR411
HS225	CAT. CHROMITE	NOT GIVEN (SEE COMMENTS)	READY AS SHIPPED FOR METHANOL	SYNTHESIS.	REDUCED FORM OF HS125	HS225
HS226	CAT. CHROMITE	NOT GIVEN (SEE COMMENTS)			SIMILAR TO HS125	HS226
HS227	CAT. CHROMITE	NOT GIVEN (SEE COMMENTS)			SIMILAR TO HS225	HS227
HS125	CAT. CHROMITE	ZNO 74, CR2O3 23	SYNTHESIZE METHANOL		CATALYST REQUIRES REDUCTION	HS125
GR404	CAT. CHROMIUM-IRON OXIDE	NOT GIVEN	WATER-GAS SHIFT REACTION	REMOVAL OF S2 FROM GAS STREAMS		GR404
HS112	CAT. CHROMIUM OXIDE ON ALUMINA	CR2O3 19, BALANCE ALUMINA	DEHYDROGENATION OF BUTANE		ACTIVATED ALUMINA CARRIER	HS112
CA702	CAT. CHROMIUM OXIDE ON ALUMINA	CR 6-8% AL2O3 BALANCE	STEAM-HYDROCARBON REFORMING			CA702
HC202	CAT. COBALT-MOLYBDATE ON AL2O3	MO(O)3 14.6% CO(O) 3.2% AL2O3	DESULFURIZATION; HYDROGENATION		REGENERATES, STEAM-AIR	HC202
CY702	CAT. COBALT-MOLYBDENA CATALYST	MOO3 15.7, COO 3.0, NA2O .02	DESULFURIZATION, HYDROGENATION	REDUCES S2 AND N2 IN PETROLEUM		CY702
CY701	CAT. COBALT-MOLYBDENA CATALYST	MOO3 15.7, COO 3.2, NA2O .02	DESULFURIZATION, HYDROGENATION	REDUCES S2 AND N2 IN PETROLEUM		CY701
GR301	CAT. COBALT-MOLY ON AL2O3	NOT GIVEN	HYDRODESULFURIZATION	HYDRODENITRIFICATION	LIMITED DROPPING DISTANCE,2FT.	GR301
HS139	CAT. COBALT CATALYST	COO 18%, BAL. ACTIVATED AL2O3				HS139
HS135	CAT. COBALT CATALYST	COO 13% ON SIO2 TYPE BASE	OXO SYNTHESIS PROCESS + HYDRO-	GENATION REACTIONS.		HS135
HS136	CAT. COBALT CATALYST	COO 6% ON SIO2 TYPE BASE	OXO SYNTHESIS PROCESS + HYDRO-	GENATION REACTIONS.		HS136
HS137	CAT. COBALT CATALYST	COO 20% ON SIO2 TYPE BASE	OXO PROCESS TO CONVERT ALDE-	HYDES TO ALCOHOLS.		HS137
HS138	CAT. COBALT CATALYST	COO 10%, BAL. ACTIVATED AL2O3	HYDROGENATION CATALYST			HS138
HS140	CAT. COBALT MOLYBDATE CATALYST	COO 3, MOO3 15, BALANCE AL2O3	DENITROGENATION + DESULFURIZA-	TION OF HYDROCARBONS.		HS140
HS106	CAT. COBALT OXIDE ON ALUMINA	COO 10, BALANCE ALUMINA	SYNTHESIS OF HYDROGEN SULFIDE			HS106
HS107	CAT. COO, CUO ON ALUMINA	COO 5, CUO 5, BALANCE ALUMINA	HYDROGENATION, DECOMPOSITION		ACTIVATED ALUMINA CARRIER	HS107
HS109	CAT. COO, MOO3 ON ALUMINA	COO 3, MOO3 12, BAL. AL2O3	HYDROCARBON DESULFURIZATION			HS109
HS110	CAT. COO, MOO3 ON ALUMINA	COO 3, MOO3 4, BALANCE ALUMINA	HYDROCARBON DESULFURIZATION			HS110
HS108	CAT. COO, MOO3 ON ALUMINA	COO 3, MOO3 9, BALANCE ALUMINA	HYDROCARBON DESULFURIZATION			HS108
HS147	CAT. COPPER CHROMATE	CUO 82,CR2O3 17				HS147
HS156	CAT. COPPER CHROMITE	CUO 51, CR2O3 47				HS156
HS157	CAT. COPPER CHROMITE	CUO 42, CR2O3 38			TABLETED CU-1800P (HS156)	HS157
HS158	CAT. COPPER CHROMITE	CUO 54, CR2O3 41				HS158
HS113	CAT. COPPER CHROMITE	CUO 37, CR2O3 52	HYDROGENATION			HS113
HS148	CAT. COPPER CHROMITE	CUO 80, CR2O3 17			TABLETED CU-0202P (HS147)	HS148
HS149	CAT. COPPER CHROMITE	CR2O3 44, CUO 41, BAO 11				HS149
HS150	CAT. COPPER CHROMITE	CR2O3 38, CUO 35, BAO 10			TABLETED CU-0401P (HS149)	HS150
HS151	CAT. COPPER CHROMITE	CR2O3 43.5, CUO 39, BAO 10				HS151
HS152	CAT. COPPER CHROMITE	CR2O3 38, CUO 33, BAO 9.5			TABLETED CU-1106P (HS151)	HS152
HS153	CAT. COPPER CHROMITE	CR2O3 46, CUO 41, BAO 9				HS153
HS154	CAT. COPPER CHROMITE	CR2O3 60, CUO 40				HS154
HS160	CAT. COPPER ON ALUMINA	CUO 10%, BAL. ACTIVATED AL2O3	REMOVAL OF TRACE AMOUNTS OF O2	FROM GAS STREAMS.		HS160
HS161	CAT. COPPER ON ALUMINA	CU 7.7%, BAL. ACTIVATED AL2O3	CHLORINATION			HS161
HS162	CAT. COPPER ON ALUMINA	CUCL2 10,BAL. ACTIVATED AL2O3P	CHLORINATION CATALYST			HS162
HS163	CAT. COPPER ON ALUMINA	CUCL2 10, BAL. ACTIVATED AL2O3	CHLORINATION CATALYST			HS163
UC307	CAT. COPPER ON MOLECULAR SIEVE	CU 1.0	HYDRODEALKYLATION			UC307
HS165	CAT. COPPER ON SILICA	CU2CO3 6%, BALANCE SIO2	DEHYDROGENATE ALCOHOLS TO	ALDEHYDES OR KETONES.		HS165
GR405	CAT. COPPER OXIDE-ALUMINA	CUO, AMOUNT NOT SPECIFIED	LOW TEMP. CO CONVERSION		POISONED BY S2, HALOGEN COMPS	GR405
HS159	CAT. COPPER	CUO 99%	REMOVE O2 + H2 FROM GAS STREAM			HS159
HS164	CAT. COPPER	CUO 79%	CONVERT ALDEHYDES TO ALCOHOLS.	REMOVE TRACE GASES (O2,CO,H2)		HS164
GR409	CAT. CO-MO ON ALUMINA	NOT GIVEN	HYDRODESULFURIZATION			GR409
GR414	CAT. CO-MO	NOT GIVEN	CONVERT S2 COMPDS TO H2S	HYDROGENATION OF OLEFINS		GR414
GR424	CAT. CO-MO	NOT GIVEN	SELECTIVE HYDROGENATION			GR424
GR427	CAT. CO ON KIESELGUHR	NOT GIVEN	HYDROGENATION			GR427
GR426	CAT. CO ON REFRACTORY OXIDE	CO 33%, REFRACTORY OXIDE-BAL.	HYDROGENATION			GR426
GR438	CAT. CU AND K PROMOTED IRON	NOT GIVEN	STYRENE PRODUCTION FROM ETHYL-	BENZENE; DEHYDROGEN.OF CUMENE		GR438
HS114	CAT. CUO ON ALUMINA	CUO 5, BALANCE ALUMINA	REMOVE O2,CO,H2 -GAS STREAM		INERT ALUMINA CARRIER	HS114
CA105	CAT. CU,ZN,AL OXIDES ON BASE	CU,ZN,AL OXIDES	PRODUCE HYDROGEN			CA105

TABLE A-2. (Continued)

CA103	CAT. IRON-CHROMIUM OXIDES	FE203 77-81%; CR203 5 11%	PRODUCE HYDROGEN		CA103
HS116	CAT. IRON OXIDE ON ALUMINA	FE203 5, BALANCE ALUMINA	AMMONIA DECOMPOSITION	INERT ALUMINA CARRIER	HS116
HS166	CAT. IRON OXIDE ON ALUMINA	FE203 20, BAL. ACTIVATED AL203	DEHYDROGENATION CATALYST		HS166
HS167	CAT. IRON OXIDE ON ALUMINA	FE203 20, BAL. ACTIVATED AL203	FLUID-BED HYDROGENATION CAT.		HS167
GR435	CAT. IRON OXIDE	NOT GIVEN	AMMONIA SYNTHESIS		GR435
GR436	CAT. IRON OXIDE	NOT GIVEN	AMMONIA DISSOCIATION		GR436
GR437	CAT. IRON OXIDE	NOT GIVEN	DEHYDROGENATION		GR437
GR412	CAT. IRON OXIDE	NOT GIVEN	REMOVAL OF S2 COMPDS FROM GAS		GR412
HC205	CAT. KAOLIN	SIO2 53%, AL203 45% FE203 0.3%			HC205
EN101	CAT. KAOLIN, CRACKING	SIO2 52.9%,AL203 45%,TIO2 1.7%	CRACKING	SUPERIOR, STEAM, THERMAL	EN101
HS171	CAT. MANGANESE OXIDE ON SILICA	MNO2 2%, BALANCE SIO2	OXIDATION CATALYST		HS171
UA103	CAT. METAL ON METAL	NI 60%, CR 20%, FE 20%	COMBUSTION HYDROCARBON FUMES	OK IN REDUCING ATMOSPHERES	UA103
HS220	CAT. METAL OXIDES ON ALUMINA	V205 5, MOO3 5, ON INERT AL203	OXIDATION CATALYST		HS220
HS229	CAT. METAL OXIDES ON ALUMINA	ZNO 38,CR203 25,/BALANCE AL203			HS229
HS230	CAT. METAL OXIDES ON ALUMINA	ZNO 10,CR203 10, BAL. AL203			HS230
HS221	CAT. METAL OXIDES ON ALUMINA	V205 6, MOO3 3, ON INERT AL203	OXIDATION CATALYST		HS221
HS201	CAT. METAL OXIDES ON ALUMINA	NIO 4,FE203 4,COO 4,AL203-SIO2	DECOMPOSITION CATALYST		HS201
HS202	CAT. METAL OXIDES ON ALUMINA	NIO 4,FE203 4,COO 4,AL203-SIO2	A DECOMPOSITION CATALYST		HS202
CA401	CAT. METAL OXIDES ON NA-AL203	CO-MO OXIDE, NI-MO OXIDE	HYDROGENATION; HYDRODESULFURIZATION; HYDRODENITRIFICATION	1 TO 5-YEAR EXPECTED LIFE	CA401
HS203	CAT. METAL OXIDES ON SILICA	NIO 10,CUO 1,BAL SIO2	HYDROGENATION CATALYST		HS203
HC206	CAT. MINERAL	SIO2 53%, AL203 45%		PROBABLY A NATURAL ZEOLITE	HC206
CA601	CAT. MIXED OXIDES	FE,K,CA,AL OXIDES	SYNTHESIS OF AMMONIA	1-2 YEARS STORAGE!	CA601
HS118	CAT. MNO2 ON ALUMINA	MNO2 19, BALANCE ALUMINA	OXIDATION	ACTIVATED ALUMINA CARRIER	HS118
NL103	CAT. MODIFIED SYNTHETIC TYPE	AL203 33, SO4 0.4, BAL. SIO2	FLUID CRACKING		NL103
NL104	CAT. MODIFIED SYNTHETIC TYPE	AL203 29, SO4 0.4, BAL. SIO2	FLUID CRACKING		NL104
NL105	CAT. MOLECULAR SIEVE TYPE	AL203 32, SO4 0.4, BAL. SIO2	FLUID CRACKING		NL105
NL106	CAT. MOLECULAR SIEVE TYPE	AL203 32, SO4 0.4, BAL. SIO2	FLUID CRACKING		NL106
CY104	CAT. MOLECULAR SIEVE	SIO2 66, AL203 34, FE .12	CRACKING		CY104
CY105	CAT. MOLECULAR SIEVE	AL203 14%, FE .05%, NA2O .02%	FLUID CRACKING		CY105
CY201	CAT. MOLECULAR SIEVE	SIO2 85, AL203 15, SO4 .1	CRACKING	SUR. AREA DEC. BY STEAM 1070F	CY201
CY101	CAT. MOLECULAR SIEVE	SIO2 86,AL203 14, FE .05	CRACKING		CY101
CY102	CAT. MOLECULAR SIEVE	SIO2 74,AL203 26,FE .05	CRACKING		CY102
CY103	CAT. MOLECULAR SIEVE	SIO2 74.6%; AL203 25%; FE .04%	CRACKING		CY103
UC402	CAT. MOLECULAR SIEVE	NOT GIVEN	ALKYLATION		UC402
UC501	CAT. MOLECULAR SIEVE	NOT GIVEN	ISOMERIZATION PENTANE,HEXANE		UC501
HS175	CAT. MOLYBDENA ON ALUMINA	MOO3 10, BAL. ACTIVATED AL203	HYDRO + DEHYDROGENATION ,ALSO HYDROFORMING.		HS175
HS173	CAT. MOLYBDENA ON ALUMINA	MOO3 10, BAL. ACTIVATED AL203	DEHYDROGENATION		HS173
HS174	CAT. MOLYBDENA ON ALUMINA	MOO3 11, BAL. ACTIVATED AL203	FLUID BED HYDROFORMING AND DEHYDROGENATION.		HS174
HS117	CAT. MOLYBDENUM SULFIDE	MOS2 66	DEHYDROGENATION, HYDROGENATION DESULFURIZATION		HS117
NL107	CAT. MO, CO, OXIDES ON ALUMINA	MOO3 12.5, COO 3.5	HYDRODESULFURIZATION		NL107
NL108	CAT. MO, CO, OXIDES ON ALUMINA	MOO3 12.5, COO 3.5	HYDRODESULFURIZATION		NL108
NL110	CAT. MO, NI ON ALUMINA	MOO3 14, NIO 2.8, SIO2 1.5	DESULFURIZATION		NL110
HS206	CAT. NICKEL-ALUMINUM	NI 49%, AL 49%	FOR FIXED BED,LOW-MODERATE TEMP. HYDROGENATION REACTIONS.	MUST BE ACTIVATED IN SITU.	HS206
NL111	CAT. NICKEL-TUNGSTEN	W 16, NI 4, SO4 0.4 BAL. AL203	SPECIFIC HYDROTREATING		NL111
HS210	CAT. NICKEL/TUNGSTEN SULFIDE	NOT GIVEN (SEE COMMENTS)		SULFIDED FORM OF HS209	HS210
HS211	CAT. NICKEL/TUNGSTEN SULFIDE	NOT GIVEN (SEE COMMENTS)		SULFIDED FORM OF HS212	HS211
HS209	CAT. NICKEL/TUNGSTEN	NI 6,W 19,BAL. SIO2/AL203	SULFIDE FORM,CRACKING FUNCTION DE-NITROGENATION/SULFURIZATION		HS209
HS198	CAT. NICKEL CATALYST	NI 46%, BASE MAT'L PROPRIETARY	HYDROGENATION CATALYST	ACTIVATE (REDUCTION)IN SITU	HS198
HS197	CAT. NICKEL CATALYST	NI 70%, BASE MAT'L PROPRIETARY	HYDROGENATION CATALYST	NOT PYROPHORIC AS SHIPPED	HS197
HS208	CAT. NICKEL FLAKES (BUFFERT)	NI 25% (NO OTHER DATA GIVEN)	HYDROGENATION OF FATTY OILS + ACIDS,METHYL ESTERS, ETC.		HS208
HS176	CAT. NICKEL HYDRATE,KIESELGUHR	NI 44(HYDRATE),BAL. KIESELGUHR	HYDROGENATION + METHANATION		HS176
GR403	CAT. NICKEL ON ALUMINA	NOT GIVEN	STEAM-HYDROCARBON REFORMING		GR403
HS199	CAT. NICKEL ON ALUMINA	NI 40%, BAL. ACTIVATED AL203	HYDROGENATION CATALYST	NOT PYROPHORIC AS SHIPPED	HS199
GR430	CAT. NICKEL ON KIESELGUHR	NI 65%,BALANCE KIESELGUHR	HYDROGENATION		GR430
HS178	CAT. NICKEL ON KIESELGUHR	NI 60, BALANCE KIESELGUHR	HYDROGENATION CAT. FOR TRICKLE BED OR LIQUID PHASE REACTIONS.	NOT PYROPHORIC AS SHIPPED.	HS178
HS179	CAT. NICKEL ON KIESELGUHR	NI 58, BALANCE KIESELGUHR	HYDROGENATION CATALYST	NOT PYROPHORIC AS SHIPPED	HS179
HS180	CAT. NICKEL ON KIESELGUHR	NI 58, BAL. KIESELGUHR		TABLETED FORM OF NI-0104P	HS180
HS181	CAT. NICKEL ON KIESELGUHR	NI 56, BALANCE KIESELGUHR	HYDROGENATION CAT. (PARTIALLY REDUCED + STABILIZED)		HS181
HS183	CAT. NICKEL ON KIESELGUHR	NI 30, BALANCE KIESELGUHR	FOR CERTAIN SPECIFIC PROBLEMS IN HARDENING SOME FATTY OILS.	CONSULT HARSHAW REP. + DETAILS	HS183
HS184	CAT. NICKEL ON KIESELGUHR	NI 60(REDUCED),BAL. KIESELGUHR	HYDROGENATION CATALYST	PYROPHORIC,SHIPPED IN LIQUID.	HS184
HS185	CAT. NICKEL ON KIESELGUHR	NI 60, BAL. KIESELGUHR	HYDROGENATION CAT.(HIGH PHYSICAL STRENGTH).	NOT PYROPHORIC AS SHIPPED	HS185
HS186	CAT. NICKEL ON KIESELGUHR	NI 28, BALANCE KIESELGUHR	HYDROGENATION CAT. (ACTIVE BUT STABLE).	NOT PYROPHORIC AS SHIPPED	HS186
HS189	CAT. NICKEL ON KIESELGUHR	NI 24 (REDUCED),BAL.,KIESELGUHR	HYDROGENATION REACTIONS		HS189
GR431	CAT. NICKEL ON KIESELGUHR	NI 54%, ZR 2%	HYDROGENATION		GR431
UC306	CAT. NICKEL ON MOLECULAR SIEVE	NI 1.0	HYDRODEALKYLATION		UC306
CA102	CAT. NICKEL ON REFRACTORY	NIO 20-40%; REFRACTORIES-BAL.	MFG. NH3, STEAM REFORMING		CA102
HS200	CAT. NICKEL OXIDE ON ALUMINA	NIO 5, MG 1.2, BAL. AL203-SIO2	A GAS REFORMING CATALYST		HS200
CA104	CAT. NICKEL OXIDE ON ALUMINA	NIO 30-70%; CARRIER BAL.	METHANATION		CA104
HS191	CAT. NICKEL OXIDE ON ALUMINA	NIO 14, BAL. ACTIVATED AL203	HYDROGENATIONS + AMINATIONS.		HS191
HS119	CAT. NICKEL OXIDE ON ALUMINA	NIO 32, BALANCE ALUMINA	HYDROGENATION	ACTIVE ALUMINA CARRIER	HS119
HS204	CAT. NICKEL OXIDE ON ALUMINA	NIO 3, BAL. ACTIVATED AL203	A GAS REFORMING CATALYST		HS204
HS193	CAT. NICKEL OXIDE ON ALUMINA	NIO 10,BAL. AL203-SIO2 (INERT)	REFORM LOW MOLECULAR WEIGHT HYDROCARBONS.		HS193
HS194	CAT. NICKEL OXIDE ON ALUMINA	NIO2 5, BALANCE AL203 (INERT)	GAS REFORMING CATALYST		HS194
HS195	CAT. NICKEL OXIDE ON ALUMINA	NIO 1.5,BAL. AL203-SIO2(INERT)	USED IN GAS REFORMING		HS195
CA701	CAT. NICKEL OXIDE ON ALUMINA	NI 6-7%; AL203 BALANCE	STEAM-HYDROCARBON REFORMING		CA701
HS187	CAT. NICKEL OXIDE ON ALUMINA	NIO 11, BAL. ACTIVATED AL203	HYDROGENATION OF DIOLEFINS TO MONO-OLEFINS (SULFIDED FORM).		HS187

TABLE A-2. (Continued)

MS188	CAT. NICKEL OXIDE ON ALUMINA	NIO 15, BAL. ACTIVATED AL203	HYDROGENATION			MS188
MS190	CAT. NICKEL OXIDE, KIESELGUHR	NIO 18, BALANCE KIESELGUHR	HYDROGENATION REACTIONS			MS190
MS182	CAT. NICKEL OXIDE, KIESELGUHR	NIO 66, BALANCE KIESELGUHR	HYDROGENATION CAT. (UNREDUCED)		MUST BE REDUCED BEFORE USE.	MS182
GR406	CAT. NICKEL	NI 32% BALANCE-NOT GIVEN	METHANATION REACTIONS			GR406
MS205	CAT. NICKEL	NIO 5, BAL. INERT CUBES	GAS REFORMING CATALYST			MS205
GR407	CAT. NICKEL	NI 32% BALANCE-NOT GIVEN	METHANATION REACTIONS			GR407
GR402	CAT. NICKEL	NOT GIVEN	STEAM-HYDROCARBON REFORMING			GR402
GR401	CAT. NICKEL	NI 15 TO 25% BALANCE-NOT GIVEN	PRODUCTION OF H2, NH3, CH3OH			GR401
MS196	CAT. NICKEL,ALUMINUM	NI 50%, AL 50%	PROCESS HYDROGENATIONS IN LOW	TO MODERATE TEMPERATURE RANGES	SUPPLIED INACTIVE	MS196
GR419	CAT. NI-CO PROMOTED	NOT GIVEN	SELECTIVE HYDROGENATION			GR419
CY302	CAT. NI-MO	MO(O)3 15%; NIO 3.1%	HYDROGENATION; DESULFURIZATION		SUBSTRATE NOT SPECIFIED	CY302
NL109	CAT. NI ON SIO2-AL203	MOO3 13, NI 4.5, SIO2 15	DESULFURIZATION			NL109
CA305	CAT. NI,CO,CR ON ALUMINA	NI,CO,CR,ALUMINA	SELECTIVE HYDROGENATION		5-YEAR EXPECTED LIFE	CA305
MS120	CAT. NI,W, ON ALUMINA,SULFIDED	NI 4.5, W 9.5, S , BAL. AL203	HYDROGENATION, DENITROGENATION		MILDLY ACIDIC	MS120
CA801	CAT. NOBLE METAL ON ALUMINA	NOT GIVEN	REMOVAL OF O2 FROM N2, NH3 AND	INERT GASES	SULFUR POISONS CATALYST	CA801
MS216	CAT. PALLADIUM CATALYST	PD 0.3,BASE MAT ; PROPRIETARY	HYDROGENATION CATALYST(STABLE)			MS216
MS215	CAT. PALLADIUM ON ALUMINA	PD 0.3%, BAL. ACTIVATED AL203	HYDROGENATION CATALYST		PD ACTIVATED + STABILIZED	MS215
GR420	CAT. PALLADIUM ON ALUMINA	NOT GIVEN	SELECTIVE HYDROGENATION			GR420
GR421	CAT. PALLADIUM ON ALUMINA	NOT GIVEN	SELECTIVE HYDROGENATION			GR421
GR422	CAT. PALLADIUM ON ALUMINA	NOT GIVEN	SELECTIVE HYDROGENATION		POISONED BY SULFUR	GR422
CA303	CAT. PALLADIUM ON ALUMINA	PD 0.045-0.055%, AL203 BALANCE	HYDROGENATION		3-YEAR EXPECTED LIFE	CA303
CA301	CAT. PALLADIUM ON ALUMINA	PALLADIUM 0.04-0.11%	HYDROGENATION		2-YEAR EXPECTED LIFE	CA301
CA302	CAT. PALLADIUM ON ALUMINA	PD 0.045-0.055%, AL203 BALANCE	HYDROGENATION		3-YEAR EXPECTED LIFE	CA302
MS214	CAT. PALLADIUM ON ALUMINA	PD 0.3%, BAL. ACTIVATED AL203	HYDROGENATION CATALYST			MS214
GR434	CAT. PALLADIUM ON CARBON	PD 1 TO 10%, CARBON BALANCE	SLURRY-TYPE HYDROGENATION		MANUFACTURING NOT EQ. TO GR433	GR434
HC206	CAT. PALLADIUM ON CARBON	PD, 5-10, AS SPECIFIED	HYDROGENATION			HC206
GR433	CAT. PALLADIUM ON CARBON	PD 1 TO 10%, CARBON BALANCE	SLURRY-TYPE HYDROGENATION			GR433
UC301	CAT. PALLADIUM ON MOL. SIEVE	PD 0.5	PENTANE-HEXANE ISOMERIZATION			UC301
UC302	CAT. PALLADIUM ON MOL. SIEVE	PD 0.5	BUTANE ISOMERIZATION			UC302
UC304	CAT. PALLADIUM ON MOL. SIEVE	PD 0.5	HYDROGENATION			UC304
UC305	CAT. PALLADIUM ON MOL. SIEVE	PD 0.5	HYDROGENATION			UC305
GR440	CAT. PALLADIUM ON SIO2-AL203	PD .05-.5,SIO2-AL203 BALANCE	HYDROGENATION			GR440
GR416	CAT. PD ON ACTIVATED ALUMINA	NOT GIVEN	REMOVAL OF O2 FROM H2 STREAMS			GR416
GR417	CAT. PD ON ACTIVATED CARBON	NOT GIVEN	REMOVAL OF O2 FROM H2 STREAMS			GR417
GR415	CAT. PD ON REFRACTORY OXIDE	PD 0.05-0.4% REFRACT OXIDE-BAL	HYDROGENATION			GR415
DG212	CAT. PELLETED SILICA/ALUMINA	SIO2 87,AL203 13,FE203 .05	DEHYDRATION CATALYST			DG212
DG213	CAT. PELLETED SILICA/ALUMINA	SIO2 75,AL203 25,FE203 .05	DEHYDRATION CATALYST			DG213
XY101	CAT. PLATINUM ON ALUMINA COMB	NOT GIVEN	NOX FUMES, HNO3 TAILS GASES		SIMILAR TORVEX DP101	XY101
GR101	CAT. PLATINUM ON ALUMINA	AL203 96.9%, NI 3%, PT 0.1%	DECOMP. OF HNO3 PLANT TAIL GAS	NOX REACT O2,CO,HYDROCARBONS	SULFUR IS POISON	GR101
HC207	CAT. PLATINUM ON ALUMINA	PT 0.5%, AL203 BAL.	DEHYDROGENATION; HYDROGENATION	REFORMING; ISOMERIZATION	51 LBS./FT.3, LOADING DENSITY	HC207
HC208	CAT. PLATINUM ON ALUMINA	PT 0.5%, AL203 BAL.				HC208
UC303	CAT. PLATINUM ON MOL. SIEVE	PT 0.5	REFORMING			UC303
MH101	CAT. PLATINUM ON TORVEX	NOT GIVEN	NOX, HYDROCARBON FUME REMOVAL		SEE DP101 AND DP102 FOR TORVEX	MH101
CY401	CAT. PLATINUM	PT-AS SPECIFIED; FE .025%	REFORMING NAPHTHAS		COST DEPENDS ON PT CONTENT	CY401
UA102	CAT. POROUS CERAMIC	NOT GIVEN	OXIDATION OF HYDROGEN (LOW T)		MFGR CAN SUPPLY MORE INFO.	UA102
UA101	CAT. POROUS CERAMIC	NOT GIVEN	OXIDATION OF SO2, HYDROCARBONS	AT LOW TEMPERATURE	MFGR CAN SUPPLY MORE INFO.	UA101
GR425	CAT. PROMOTED COBALT	CO 60% IN OXIDIZED FORM	PRODUCTION OF PRIMARY AMINES	HYDROGENATION		GR425
FN208	CAT. REFORMING	AL203 81.5, FE203 3.5,TIO2 3.5	REFORMING CAT FOR GASOLINE AND	NAPTHAS		FN208
NL113	CAT. SILICA-ALUMINA	AL203 33, NA2O .09, SIO2-BAL.	FLUID CRACKING			NL113
HC209	CAT. SILICA-ALUMINA, SYNTHETIC	SIO2 87.3%; AL203 12.4	FIXED BED CRACKING;	ISOMERIZATION, ALSO CARRIER	REGENERABLE BY AIR	HC209
DG211	CAT. SILICA/ALUMINA	SIO2 87, AL203 13, IMPURITY .3	REACTIONS REQ G AN ACID CATALY	ST (ALKYATION,ESTERIFICATION),	HIGH ACIDITY	DG211
DG210	CAT. SILICA/MAGNESIA	SIO2 70%, MGO 30% (DRY BASIS)	ESTERIFICATION REACTIONS; GAS/	OIL CRACKING (SUPPORT CAT.).	ALSO AVAILABLE AS A FLUID.	DG210
MS126	CAT. SILVER ON ALUMINA	AG 4.0 BALANCE AL203	OXIDATION OF METHANOL TO FORM-	ALDEHYDE		MS126
NL102	CAT. SYNTHETIC SIO2-AL203 TYPE	AL203 25, SO4 0.4, BAL. SIO2	FLUID CRACKING			NL102
NL101	CAT. SYNTHETIC SIO2-AL203 TYPE	AL203 13, SO4 0.4, BAL. SIO2	FLUID CRACKING			NL101
AC302	CAT. TABLETED ALUMINA	AL203 99.5%, SO3 .09, CAO .04%	LOW-SURFACE-AREA CATALYST	AGGREGATE(CASTABLE REFRACTORY)	AVAIL. AS CONVERTER DISCHARGE.	AC302
MS217	CAT. TITANIA ON ALUMINA	TIO2 86%, BALANCE AL203				MS217
MS222	CAT. TUNGSTEN OXIDE ON ALUMINA	WO3 10, BAL. ACTIVATED AL203				MS222
MS224	CAT. TUNGSTEN OXIDE ON ALUMINA	WO3 10, BAL. ACTIVATED AL203	DEHYDRATION			MS224
MS223	CAT. TUNGSTEN OXIDE	WO3 95% (APPROX.)	DEHYDRATION		SHOULD BE REDUCED BEFORE USE.	MS223
CY501	CAT. VANADIA-SILICA	V205 6.1, K20 19.8, SIO2 62.	MFG OF PHTHALIC ANHYDRIDE			CY501
MS122	CAT. VANADIA ON ALUMINA	V205 10, BALANCE ALUMINA	OXIDATION		HIGH ACTIVITY ALUMINA CARRIER	MS122
MS123	CAT. VANADIA ON ALUMINA	V205 10, BALANCE ALUMINA	OXIDATION		INERT ALUMINA CARRIER	MS123
MS121	CAT. VANADIA ON SILICA-ALUMINA	V205 10, BAL. SILICA-ALUMINA	OXIDATION			MS121
CA201	CAT. VANADIA, K-PROMOTED	V205 9-10%, K20 14-15%	H2SO4 CONTACT CATALYST			CA201
CY601	CAT. VANADIA, SULFURIC ACID	V205 9.1%, K20 10.1%; FE .45%	CONTACT SULFURIC ACID PROCESS		SUBSTRATE NOT SPECIFIED	CY601
MS219	CAT. VANADIUM OXIDE ON ALUMINA	V205 10, BALANCE AL203	OXIDATION			MS219
MS218	CAT. VANADIUM OXIDE ON ALUMINA	V205 10, BAL. ACTIVATED AL203	OXIDATION			MS218
MN102	CAT. VANADIUM OXIDE	V205,CARRIER NOT SPECIFIED	H2SO4 CONTACT CATALYST		FOR HIGH SO3 CONCENTRATIONS	MN102
MN103	CAT. VANADIUM OXIDE	V205,CARRIER NOT SPECIFIED	H2SO4 CONTACT CATALYST		RUGGED IN FIXED-BED OPERATION	MN103
MN101	CAT. VANADIUM OXIDE	V205,CARRIER NOT SPECIFIED	H2SO4 CONTACT CATALYST		IMMUNE TO COMMON POISONS	MN101
MS232	CAT. ZINC ACETATE	ZN(C2H302)2 10%, BAL. CARBON	CONVERT ACETYLENE AND ACETIC	ACID TO VINYL ACETATE MONOMER		MS232
MS231	CAT. ZINC OXIDE ON ALUMINA	ZNO 24 ,BAL. ACTIVATED AL203				MS231

TABLE A-2. (Continued)

HS228	CAT. ZINC OXIDE	ZNO 100%	REMOVAL OF SULFUR FROM GAS	STREAMS.		HS228
HS124	CAT. ZINC	ZNO 75%, AL, MG, CA, CR OXIDES	DESULFURIZATION			HS124
HS233	CAT. ZIRCONIA	ZRO2 98%, BALANCE AL203				HS233
GR432	CAT. ZR PROMOTED NI	NI 33%, BALANCE-NOT GIVEN	HYDROGENATION			GR432
HS207	CAT. (HYSEL)	NI 30(ACTIVE)BASE PROPRIETARY	SUPERIOR SELECTIVITY IN THE	HYDROGENATION OF EDIBLE OILS.	CONSULT HANSHAW REP.,DETAILS	HS207
AC303	CAT. ACTIVATED ALUMINA	AL203 64%, NICKEL FORMATE 2.5%	CATALYST(PROD. OF CONTROLLED	ATMOS. IN HEAT-TREATING FURN.)	GRADE F-1 + NICKEL FORMATE	AC303
HS134	CAT. COBALT ON KIESELGUHR	CO 39% BALANCE KIESELGUHR	OXO PROCESS + RELATED HYDROGEN	ATION REACTIONS.		HS134
C4304	CAT. PALLADIUM ON SPECIAL CAR.	NOT GIVEN	SELECTIVE HYDROGENATION		3-YEAR EXPECTED LIFE	C4304
KC101	CAR. ACTIVATED ALUMINA	AL203 93.6%, NA20 0.30%				KC101
FN203	CAR. ACTIVATED BAUXITE	AL203 81.5, SIO2 10.5,TIO2 3.5			ALSO USED AS SORBANT, CATALYST	FN203
FN204	CAR. ACTIVATED BAUXITE	AL203 93.5, SIO2 2.5, TIO2 2.0	DEFLUORINATION MEDIUM		ALSO USED AS CATALYST	FN204
NL112	CAR. ALUMINA BASE	ALUMINA				NL112
HS105	CAR. ALUMINA CATALYST	AL203 97			HIGH ACTIVITY ALUMINA CARRIER	HS105
HS101	CAR. ALUMINA CATALYST	AL203 99	DRYING AGENT, DEHYDRATION		ALUMINA IS ACTIVATED	HS101
HS102	CAR. ALUMINA CATALYST	AL203 96	DRYING AGENT, DEHYDRATION		HIGH ACTIVITY ALUMINA CARRIER	HS102
HS103	CAR. ALUMINA CATALYST	AL203 98			HIGH ACTIVITY ALUMINA CARRIER	HS103
HS104	CAR. ALUMINA CATALYST	AL203 92, SIO2 6			HIGH ACTIVITY ALUMINA CARRIER	HS104
DP101	CAR. ALUMINA HONEYCOMB, TORVEX	AL203 96%,MGAL204 3%,MULLITE 1	OXIDATION OF HYDROCARBON FUMES	REDUCTION NITROGEN OXIDE FUMES	STRONG, THERMALLY STABLE	DP101
HS131	CAR. ALUMINA	AL203 92%, SIO2 6%				HS131
RH101	CAR. ALUMINA	AL203 92.2,NA20 .5,SIO2 .10				RH101
HS130	CAR. ALUMINA	AL203 97%	FLUID HEU OPERATIONS			HS130
AC301	CAR. ALUMINA, CATALYTIC GRADE	MGO,AL203,SIO2	REFORMING,CRACKING			AC301
CC101	CAR. ALUMINA, GAS REFORMING	AL203 99.5%, NA20 0.45%	GAS REFORMING		RESISTANT TO STEAM AND H2	CC101
HC203	CAR. ALUMINA, HARD	AL203 98.0% NA20 0.1%	REFORMING, ISOMERIZATION	ALKYLATION, DEHYDRATION	TRUE DENSITY, SOLID 230	HC203
CC338	CAR. ALUMINUM OXIDE (SINTERED)	AL203 96,SIO2 2.4,FE203 .64			EXTRA-HIGH POROSITY, FINE PORE	CC338
CC339	CAR. ALUMINUM OXIDE (SINTERED)	AL203 96,SIO2 1.3,CAO 1.2			EXTRA-HIGH POROSITY, FINE PORE	CC339
CC340	CAR. ALUMINUM OXIDE (SINTERED)	AL203 99,NA20 .5,FE203 .04			EXTRA-HIGH POROSITY, FINE PORE	CC340
CC341	CAR. ALUMINUM OXIDE (SINTERED)	AL203 82,SIO2 9.5,MGO 3,BAO 2			EXTRA-HIGH POROSITY, FINE PORE	CC341
CC342	CAR. ALUMINUM OXIDE (SINTERED)	AL203 99.8,SIO2 .08,FE203 .04			EXTRA-HIGH POROSITY, FINE PORE	CC342
CC324	CAR. ALUMINUM OXIDE (SINTERED)	AL203 84,SIO2 10,TIO2 .55			HIGH POROSITY, OPEN STRUCTURE	CC324
CC325	CAR. ALUMINUM OXIDE (SINTERED)	AL203 96,SIO2 2.4,FE203 0.64			HIGH POROSITY, TIGHT STRUCTURE	CC325
CC326	CAR. ALUMINUM OXIDE (SINTERED)	AL203 99.5,NA20 .45,FE203 .03			HIGH POROSITY, TIGHT STRUCTURE	CC326
CC327	CAR. ALUMINUM OXIDE (SINTERED)	AL203 96,SIO2 2.4, FE203 .64			MED. POROSITY, TIGHT STRUCTURE	CC327
CC337	CAR. ALUMINUM OXIDE (SINTERED)	AL203 96,SIO2 2.4,FE203 .64			EXTRA-HIGH POROSITY,FINE PORE	CC337
CC306	CAR. ALUMINUM OXIDE, FUSED.	AL203 85.5,SIO2 10.5,TIO2 1.8			LOW POROSITY, COARSE GRANULE	CC306
CC307	CAR. ALUMINUM OXIDE, FUSED.	AL203 85,SIO2 11,TIO2 1.9			MEDIUM POROSITY,COARSE GRANULE	CC307
CC308	CAR. ALUMINUM OXIDE, FUSED.	AL203 85.5,SIO2 10.5,TIO2 1.8			MEDIUM POROSITY + GRANULE	CC308
CC309	CAR. ALUMINUM OXIDE, FUSED.	AL203 84,SIO2 11,TIO2 2.2			MEDIUM POROSITY,OPEN STRUCTURE	CC309
CC310	CAR. ALUMINUM OXIDE, FUSED.	AL203 72,SIO2 22,TIO2 1.8			MED. POROSITY, TIGHT STRUCTURE	CC310
CC305	CAR. ALUMINUM OXIDE, FUSED.	AL203 72,SIO2 22,TIO2 1.8			EXTRA-LOW POROSITY,TIGHT STRU.	CC305
CC302	CAR. ALUM. OXIDE,FUSED (WHITE)	AL203 89,SIO2 9,CAO .6, BAO .5			MEDIUM POROSITY + PERMEABILITY	CC302
CC303	CAR. ALUM. OXIDE,FUSED (WHITE)	AL203 80,SIO2 18.5, TIO2 .55			MED. POROSITY, TIGHT STRUCTURE	CC303
CC304	CAR. ALUM. OXIDE,FUSED (WHITE)	AL203 86.5,SIO2 10.4,CAO .53			MED. POROSITY,TIGHT STRUCTURE	CC304
CC301	CAR. ALUM. OXIDE,FUSED (WHITE)	AL203 88,SIO2 9,CAO 1,NA20 .52			MEDIUM POROSITY,COARSE GRANULE	CC301
CC201	CAR. CARBON-ON-ALUMINA	AL203 89%, CARBON 11%.				CC201
AL102	CAR. CORDIERITE	MGO,AL203,(5/2SIO2)	CARRIER IN HCN REACTOR	NOX FUME ABATEMENT EQUIPMENT		AL102
AL101	CAR. HONEYCOMB, ALUMINA	ALUMINA 96% (ALSIMAG 614)	NOX FUME ABATEMENT	HCN REACTOR	SUPPLY ENGELHARD,OXY-CATALYST	AL101
HS115	CAR. MAGNESIA	MGO 98				HS115
DP102	CAR. MULLITE HONEYCOMB, TORVEX	MULLITE 55%,SIO2 30%,AL203 15%	OXIDATION OF HYDROCARBON FUMES	REDUCTION NITROGEN OXIDE FUMES	STRONG, THERMALLY STABLE	DP102
CC321	CAR. MULLITE	AL203 67,SIO2 30,CAO .7			LOW POROSITY,COARSE GRANULE	CC321
CC322	CAR. MULLITE	AL203 68,SIO2 29,CAO 1,BAO .49			MED. POROSITY,COARSE GRANULE	CC322
CC323	CAR. MULLITE	AL203 69,SIO2 30,NA20 .43			MED. POROSITY, TIGHT STRUCTURE	CC323
DG201	CAR. SILICA-ALUMINA,ZEOLITE	AL203 31, SIO2 69, SO4 0.4			ATTRITION RESIST. IN FLUID BED	DG201
DG202	CAR. SILICA-ALUMINA, ZEOLITE	SIO2 87, AL203 13	DEHYDRATION REACTIONS			DG202
DG209	CAR. SILICA GEL	SIO2 99.5,NA02 .09,FE .02	CARRIER / SUPPORT FOR CATALYST	USED IN THE CHEMICAL INDUSTRY.		DG209
DG203	CAR. SILICA GEL	SIO2 99.7,FE .03,NA20 .02	CARRIER / SUPPORT FOR CATALYST	USED IN THE CHEMICAL INDUSTRY.		DG203
DG204	CAR. SILICA GEL	SIO2 99.5, NA20 .09, FE .02	CARRIER / SUPPORT FOR CATALYST	USED IN THE CHEMICAL INDUSTRY.		DG204
DG205	CAR. SILICA GEL	SIO2 99.6, FE .03, NA20 .02	CARRIER / SUPPORT FOR CATALYST	USED IN THE CHEMICAL INDUSTRY.		DG205
DG206	CAR. SILICA GEL	SIO2 99.5, FE .03, NA20 .02	CARRIER / SUPPORT FOR CATALYST	USED IN THE CHEMICAL INDUSTRY.		DG206
DG208	CAR. SILICA GEL	SIO2 99.5,FE .02,AL203 .20	CARRIER / SUPPORT FOR CATALYST	USED IN THE CHEMICAL INDUSTRY.		DG208
CC329	CAR. SILICA	SIO2 94,NA20 2.6,CAO 2,MGO .81			LOW POROSITY, COARSE GRANULE	CC329
CC330	CAR. SILICA	SIO2 95,NA20 3.6,AL203 .56			MED. POROSITY, COARSE GRANULE	CC330
CC331	CAR. SILICA	SIO2 81,AL203 15,NA20 1,K20 1			MED. POROSITY, TIGHT STRUCTURE	CC331
CC332	CAR. SILICA	SIO2 94,NA20 4.5,CAO .59			MED. POROSITY, TIGHT STRUCTURE	CC332
CC333	CAR. SILICA	SIO2 95,CAO 4.95,AL203 .23			MED. POROSITY, TIGHT STRUCTURE	CC333
CC328	CAR. SILICA	SIO2 93,AL203 6,BAO .4,MGO .33			HIGH POROSITY, TIGHT STRUCTURE	CC328
EP102	CAR. SILICA, DIATOMACEOUS	SIO2 92, AL203 5, FE203 1.8	CATALYST SUPPORT			EP102
EP101	CAR. SILICA, DIATOMACEOUS	AL203 92%,AL203 5%,FE203 1.8%	CARRIER FREE FROM POISONS		FREE FROM CATALYTIC POISONS	EP101
CC317	CAR. SILICON CARBIDE	SIC 78,SIO2 15,AL203 4,CAO 1			MED. POROSITY,COARSE STRUCTURE	CC317
CC318	CAR. SILICON CARBIDE	AL203 4,SIC 78,SIO2 14,CAO 1.3			MEDIUM POROSITY + GRANULE SIZE	CC318
CC319	CAR. SILICON CARBIDE	SIC 77,SIO2 16,AL203 6,K20 .55			MEDIUM POROSITY,OPEN STRUCTURE	CC319
CC320	CAR. SILICON CARBIDE	SIC 59,SIO2 27,AL203 11,NA20 1			MED. POROSITY, TIGHT STRUCTURE	CC320
CC311	CAR. SILICON CARBIDE	SIC 59,SIO2 27,AL203 11,NA20 1			EXTRA-LOW POROSITY,TIGHT STRU.	CC311
CC312	CAR. SILICON CARBIDE	SIC 78,SIO2 15,AL203 5.5			HIGH POROSITY, OPEN STRUCTURE	CC312
CC313	CAR. SILICON CARBIDE	SIC 80,SIO2 14,AL203 4,NA20 .7			HIGH POROSITY, TIGHT STRUCTURE	CC313

TABLE A-2. (Continued)

CC314	CBR, SILICON CARBIDE	SIC 80,SIO2 14,AL2O3 4,NA2O .7			LOW POROSITY, COARSE GRANULE	CC314
CC315	CBR, SILICON CARBIDE	SIC 77.5,SIO2 15,AL2O3 5.5			LOW POROSITY, OPEN STRUCTURE	CC315
CC316	CBR, SILICON CARBIDE	SIC 59,SIO2 26.5,AL2O3 11			LOW POROSITY, TIGHT STRUCTURE	CC316
NC101	CBR, ZEOLITE, SYNTHETIC	NOT GIVEN	ALKYLATION AND ISOMERIZATION	DRY REFORMER RECYCLE HYDROGEN		NC101
CC336	CBR, ZIRCONIA	ZRO2 93,CAO 5,SIO2 .6,AL2O3 .5			MED, POROSITY, TIGHT STRUCTURE	CC336
CC335	CBR, ZIRCON	ZRO2 54,SIO2 38,AL2O3 7,CAO .6			LOW POROSITY, TIGHT STRUCTURE	CC335
CC334	CBR, ZIRCON	ZRO2 60,SIO2 36,AL2O3 2,CAO .9			LOW POROSITY, COARSE GRANULE	CC334
AC103	SOR,ACTIVATED ALUMINA	AL2O3 88, NA2O .86, COCL2 2.0%	BREATHER EQUIP, + APPLIC, REQ,	VISIBLE IND. OF ADSORPTION		AC103
DG104	SOR,SILICA GEL	SIO2 99.7, AL2O3 .10, TIO2 .09	AIR AND GAS DRYING	POSSIBLE CATALYST OR CARRIER	VERY LIMITED USES IN LIQUIDS	DG104
AC101	SOR, ACTIVATED ALUMINA	AL2O3 92%, NA2O 0.9%	DRYING GASES AND LIQUIDS	MAINTENANCE OF TRANSFORMER OIL		AC101
EN202	SOR, ACTIVATED BAUXITE	AL2O3 78, SIO2 9, FE2O3 8,	FOR REFINING PETROLEUM PRODUCT	DECOLORIZES; DEODORIZES; DRIES		EN202
EN206	SOR, ACTIVATED BAUXITE	AL2O3 81.5, SIO2 10, TIO2 3.5	DESSICANT FOR HYDROCARBONS,H2S			EN206
EN207	SOR, ACTIVATED BAUXITE	NOT GIVEN	OVERCOME SOURING OF HYDROCHNS	DRYING HALOGENATED HYDROCBNS		EN207
GR202	SOR, ACTIVATED CARBON	NOT GIVEN	DESULFURIZING GAS STREAMS	FIXED BED OPERATIONS		GR202
GR439	SOR, ACTIVATED CARBON	NOT GIVEN	REMOVAL OF S2 COMPDS FROM GAS			GR439
RC101	SOR, ACTIVATED CARBON	CARBON	REMOVES TOXIC GASES FROM AIR			RC101
AC104	SOR, ALUMINA GEL	AL2O3 90, SIO2 2.2, NA2O 1.6%	DRYING GASSES UNDER HIGH PRESS	+ STATIC DRYING APPLICATIONS	NONTOXIC	AC104
MS128	SOR, ALUMINA	AL2O3 98%, BALANCE MOISTURE				MS128
MS129	SOR, ALUMINA	AL2O3 92%	CHROMATOGRAPHIC ADSORPTION			MS129
MS127	SOR, ALUMINA	AL2O3 98%, BALANCE MOISTURE				MS127
DG302	SOR, MOLECULAR SIEVE	NOT GIVEN	REMOVAL OF H2S, CO2, + ETHYL	MERCAPTAN FROM NATURAL GAS,		DG302
DG303	SOR, MOLECULAR SIEVE	NOT GIVEN	DEHYDRATION OF MOST FLUIDS			DG303
DG304	SOR, MOLECULAR SIEVE	NOT GIVEN	REMOVAL OF CO2 + H2O FROM AIR,	+ H2S + MERCAPTAN FROM L.P.G.		DG304
DG305	SOR, MOLECULAR SIEVE	NOT GIVEN	REFRIGERATION SYSTEMS			DG305
UC101	SOR, MOLECULAR SIEVE	NOT GIVEN	REMOVES SO2 AND OXIDES OF N2	FROM PROCESS STREAMS		UC101
UC102	SOR, MOLECULAR SIEVE	NOT GIVEN	REMOVES SO2 AND OXIDES OF N2	FROM STREAMS; DRIES SOUR GAS		UC102
UC201	SOR, MOLECULAR SIEVE	NOT GIVEN	SEPARATES NORMAL FROM BRANCHED	PARAFFINS		UC201
UC202	SOR, MOLECULAR SIEVE	NOT GIVEN	REMOVES H2O, CO2, H2S FROM GAS			UC202
UC203	SOR, MOLECULAR SIEVE	NOT GIVEN	DEHYDRATION			UC203
UC204	SOR, MOLECULAR SIEVE	NOT GIVEN	DEHYDRATION; DESSICANT			UC204
DG301	SOR, MOLECULAR SIEVE	NOT GIVEN	DRYING UNSATURATED HYDROCARBON	(ETHYLENE,PROPYLENE,BUTADIENE) *		DG301
DG113	SOR, SILICA GEL	SIO2 99.7, AL2O3 .10, TIO2 .09	SELECTIVE ADSORPTION- USED FOR	LIQUID OR GAS PHASE SEPARATION		DG113
DG114	SOR, SILICA GEL	SIO2 99.7, AL2O3 .10, TIO2 .09	SELECTIVE ADSORPTION- USED FOR	LIQUID OR GAS PHASE SEPARATION		DG114
DG115	SOR, SILICA GEL	SIO2 99.7, AL2O3 .10, TIO2 .09	SELECTIVE ADSORPTION- USED FOR	LIQUID OR GAS PHASE SEPARATION		DG115
DG116	SOR, SILICA GEL	SIO2 99.7, AL2O3 .10, TIO2 .09	SELECTIVE ADSORPTION- USED FOR	LIQUID OR GAS PHASE SEPARATION		DG116
DG117	SOR, SILICA GEL	SIO2 99.7, AL2O3 .10 TIO2 .09	DESSICANT		COLORED LT. BROWN	DG117
DG118	SOR, SILICA GEL	SIO2 99.7, AL2O3 .10, TIO2 .09	SOURCE OF SIO2 IN CHEM REAX	ANTI-CAKING AGENT		DG118
DG119	SOR, SILICA GEL	SIO2 99.7, AL2O3 .10, TIO2 .09	INDICATING DESICCANT		CHNGES COLOR AS HUMIDITY CHNGS	DG119
DG120	SOR, SILICA GEL	SIO2 99.7, AL2O3 .10, TIO2 .09	INDICATING DESICCANT			DG120
DG121	SOR, SILICA GEL	SIO2 99.7, AL2O3 .10, TIO2 .09	INDICATING DESICCANT			DG121
DG122	SOR, SILICA GEL	SIO2 99.7, AL2O3 .10, TIO2 .09	INDICATING DESICCANT			DG122
DG123	SOR, SILICA GEL	SIO2 99.7, AL2O3 .10, TIO2 .09	DESICCANT		VERY POROUS	DG123
DG124	SOR, SILICA GEL	SIO2 99.7, AL2O3 .10, TIO2 .09	ANTI-CAKING AGENT			DG124
DG125	SOR, SILICA GEL	SIO2 99.7, AL2O3 .10, TIO2 .09	DESICCANT, POSSIBLE USE AS CAR	OR AS SELECTIVE ADSORBANT		DG125
DG126	SOR, SILICA GEL	SIO2 99.7, AL2O3 .10, TIO2 .09	USED TO INTRODUCE H2O TO SYSTM			DG126
DG127	SOR, SILICA GEL	SIO2 99.7, AL2O3 .10, TIO2 .09	CHROMATOGRAPHIC SEPARATION			DG127
DG102	SOR, SILICA GEL	SIO2 99.7, AL2O3 .10, TIO2 .09	AIR AND GAS DRYING	POSSIBLE CATALYST OR CARRIER	ALSO USED IN LIQUIDS	DG102
DG103	SOR, SILICA GEL	SIO2 99.7, AL2O3 .10, TIO2 .09	AIR AND GAS DRYING	POSSIBLE CATALYST OR CARRIER	ALSO USED IN LIQUIDS	DG103
DG101	SOR, SILICA GEL	SIO2 99.71%	AIR AND GAS DRYING			DG101
DG105	SOR, SILICA GEL	SIO2 99.7, AL2O3 .10, TIO2 .09	AIR AND GAS DRYING	USED AS CAT IN LIQ PROCESSES		DG105
DG106	SOR, SILICA GEL	SIO2 99.7, AL2O3 .10, TIO2 .09	AIR AND GAS DRYING	WIDELY USED AS SOR WITH LIQS	SOME USE AS CAT IN LIQ PROCESS	DG106
DG107	SOR, SILICA GEL	SIO2 99.7, AL2O3 .10, TIO2 .09	AIR AND GAS DRYING	LIMITED USE WITH LIQUIDS	POSSIBLE USE AS CATALYST	DG107
DG108	SOR, SILICA GEL	SIO2 99.7, AL2O3 .10, TIO2 .09	AIR AND GAS DRYING	POSSIBLE CATALYST OR CARRIER		DG108
DG109	SOR, SILICA GEL	SIO2 99.7, AL2O3 .10, TIO2 .09	SELECTIVE ADSORPTION- USED FOR	LIQUID OR GAS PHASE SEPARATION		DG109
DG110	SOR, SILICA GEL	SIO2 99.7, AL2O3 .10, TIO2 .09	SELECTIVE ADSORPTION- USED FOR	LIQUID OR GAS PHASE SEPARATION		DG110
DG111	SOR, SILICA GEL	SIO2 99.7, AL2O3 .10, TIO2 .09	SELECTIVE ADSORPTION- USED FOR	LIQUID OR GAS PHASE SEPARATION		DG111
DG112	SOR, SILICA GEL	SIO2 99.7, AL2O3 .10, TIO2 .09	SELECTIVE ADSORPTION- USED FOR	LIQUID OR GAS PHASE SEPARATION		DG112
GR413	SOR, ZINC OXIDE	NOT GIVEN	REMOVES H2S FROM GAS STREAMS			GR413
AC102	SOR, ACTIVATED ALUMINA	AL2O3 77%, NA2O 0.8% CACL2 9.3				AC102
UC401						UC401

TABLE A-3. MASTER TABLE SORTED ON COMPOSITION

CODE	NAME AND CLASSIFICATION	COMPOSITION	MAJOR USES	MAJOR USES	COMMENTS	CODE
MS126	CAT. SILVER ON ALUMINA	AG 4.0 BALANCE AL2O3	OXIDATION OF METHANOL TO FORM-	ALDEHYDE		MS126
AL101	CAR. HONEYCOMB. ALUMINA	ALUMINA 96% (ALSIMAG 614)	NOX FUME ABATEMENT	HCN REACTOR	SUPPLY ENGELHARD.OXY-CATALYST	AL101
NL112	CAR. ALUMINA BASE	ALUMINA				NL112
NL101	CAT. SYNTHETIC SIO2-AL2O3 TYPE	AL2O3 13. SO4 0.4. BAL. SIO2	FLUID CRACKING			NL101
CY105	CAT. MOLECULAR SIEVE	AL2O3 14%. FE .05%. NA2O .02%	FLUID CRACKING			CY105
NL102	CAT. SYNTHETIC SIO2-AL2O3 TYPE	AL2O3 25. SO4 0.4. BAL. SIO2	FLUID CRACKING			NL102
NL104	CAT. MODIFIED SYNTHETIC TYPE	AL2O3 29. SO4 0.4. BAL. SIO2	FLUID CRACKING			NL104
DG201	CAR. SILICA-ALUMINA.ZEOLITE	AL2O3 31. SIO2 69. SO4 0.4			ATTRITION RESIST. IN FLUID BED	DG201
NL106	CAT. MOLECULAR SIEVE TYPE	AL2O3 32. SO4 0.4. BAL. SIO2	FLUID CRACKING			NL106
NL105	CAT. MOLECULAR SIEVE TYPE	AL2O3 32. SO4 0.4. BAL. SIO2	FLUID CRACKING			NL105
NL113	CAT. SILICA-ALUMINA	AL2O3 33. NA2O .09. SIO2-BAL.	FLUID CRACKING			NL113
NL103	CAT. MODIFIED SYNTHETIC TYPE	AL2O3 33. SO4 0.4. BAL. SIO2	FLUID CRACKING			NL103
CC318	CAR. SILICON CARBIDE	AL2O3 4.SIC 78.SIO2 14.CAO 1.3			MEDIUM POROSITY + GRANULE SIZE	CC318
CC321	CAR. MULLITE	AL2O3 67.SIO2 30.CAO .7			LOW POROSITY.COARSE GRANULE	CC321
CC322	CAR. MULLITE	AL2O3 68.SIO2 29.CAO 1.BAO .49			MED. POROSITY.COARSE GRANULE	CC322
CC323	CAR. MULLITE	AL2O3 69.SIO2 30.NA2O .43			MED. POROSITY. TIGHT STRUCTURE	CC323
CC310	CAR. ALUMINUM OXIDE. FUSED.	AL2O3 72.SIO2 22.TIO2 1.8			MED. POROSITY. TIGHT STRUCTURE	CC310
CC305	CAR. ALUMINUM OXIDE. FUSED.	AL2O3 72.SIO2 22.TIO2 1.8			EXTRA-LOW POROSITY.TIGHT STRU.	CC305
EN201	CAT. ACTIVATED BAUXITE	AL2O3 72. FE2O3 12. SIO2 11	DESULFURIZATION OF PETROLEUM			EN201
AC102	SOR. ACTIVATED ALUMINA	AL2O3 77%. NA2O 0.8% CACL2 9.3				AC102
EN202	SOR. ACTIVATED BAUXITE	AL2O3 78. SIO2 9. FE2O3 4.	FOR REFINING PETROLEUM PRODUCT	DECOLORIZES: DEODORIZES: DRIES		EN202
CC303	CAR. ALUM. OXIDE.FUSED (WHITE)	AL2O3 80.SIO2 19.5. TIO2 .55			MED. POROSITY, TIGHT STRUCTURE	CC303
EN208	CAT. REFORMING	AL2O3 81.5. FE2O3 3.5.TIO2 3.5.	REFORMING CAT FOR GASOLINE AND	NAPTHAS		EN208
EN206	SOR. ACTIVATED BAUXITE	AL2O3 81.5. SIO2 10. TIO2 3.5	DESSICANT FOR HYDROCARBONS.H2S			EN206
EN203	CAR. ACTIVATED BAUXITE	AL2O3 81.5. SIO2 10.5.TIO2 3.5			ALSO USED AS SORBANT. CATALYST	EN203
CC341	CAR. ALUMINUM OXIDE (SINTERED)	AL2O3 82.SIO2 9.5.MGO 3.BAO 2			EXTRA-HIGH POROSITY. FINE PORE	CC341
CC309	CAR. ALUMINUM OXIDE. FUSED.	AL2O3 84.SIO2 11.TIO2 2.2			MEDIUM POROSITY.OPEN STRUCTURE	CC309
CC304	CAR. ALUM. OXIDE.FUSED (WHITE)	AL2O3 84.5.SIO2 10.4.CAO .53			MED. POROSITY.TIGHT STRUCTURE	CC304
AC303	CAT. ACTIVATED ALUMINA	AL2O3 84%. NICKEL FORMATE 2.5%	CATALYST(PROD. OF CONTROLLED	ATMOS. IN HEAT-TREATING FURN.)	GRADE F-1 + NICKEL FORMATE	AC303
CC307	CAR. ALUMINUM OXIDE. FUSED.	AL2O3 85.SIO2 11.TIO2 1.9			MEDIUM POROSITY.COARSE GRANULE	CC307
CC306	CAR. ALUMINUM OXIDE. FUSED.	AL2O3 85.5.SIO2 10.5.TIO2 1.8			LOW POROSITY. COARSE GRANULE	CC306
CC308	CAR. ALUMINUM OXIDE. FUSED.	AL2O3 85.5.SIO2 10.5.TIO2 1.8			MEDIUM POROSITY + GRANULE	CC308
CC324	CAR. ALUMINUM OXIDE (SINTERED)	AL2O3 88.SIO2 10.TIO2 .55			HIGH POROSITY, OPEN STRUCTURE	CC324
CC301	CAR. ALUM. OXIDE.FUSED (WHITE)	AL2O3 88.SIO2 9.CAO 1.NA2O .52			MEDIUM POROSITY.COARSE GRANULE	CC301
AC103	SOR.ACTIVATED ALUMINA	AL2O3 88. NA2O .86. COCL2 2.0%	BREATHER EQUIP. + APPLIC. REQ.	VISIBLE IND. OF ADSORPTION		AC103
EN205	CAT. ACTIVATED BAUXITE	AL2O3 88. SIO2 5. TIO2 3	SULFUR RECOVERY UNITS			EN205
CC302	CAR. ALUM. OXIDE.FUSED (WHITE)	AL2O3 89.SIO2 9.CAO .6. BAO .5			MEDIUM POROSITY + PERMEABILITY	CC302
CC201	CAR. CARBON-ON-ALUMINA	AL2O3 89%. CARBON 11%.				CC201
AC104	SOR. ALUMINA GEL	AL2O3 90. SIO2 2.2. NA2O 1.6%	DRYING GASSES UNDER HIGH PRESS	+ STATIC DRYING APPLICATIONS	NONTOXIC	AC104
MS234	CAT. ALUMINA	AL2O3 91%. SIO2 6%	CATALYST SUPPORT			MS234
MS106	CAR. ALUMINA CATALYST	AL2O3 92. SIO2 6			HIGH ACTIVITY ALUMINA CARRIER	MS106
BM101	CAR. ALUMINA	AL2O3 92.2.NA2O .5.SIO2 .10				BM101
MS129	SOR. ALUMINA	AL2O3 92%	CHROMATOGRAPHIC ADSORPTION			MS129
AC101	SOR. ACTIVATED ALUMINA	AL2O3 92%. NA2O 0.9%	DRYING GASES AND LIQUIDS	MAINTENANCE OF TRANSFORMER OIL		AC101
MS131	CAR. ALUMINA	AL2O3 92%. SIO2 8%				MS131
FP101	CAR. SILICA. DIATOMACEOUS	AL2O3 92%.AL2O3 5%.FE2O3 1.8%	CARRIER FREE FROM POISONS		FREE FROM CATALYTIC POISONS	FP101
EN204	CAR. ACTIVATED BAUXITE	AL2O3 93.5. SIO2 2.5. TIO2 2.0	DEFLUORINATION MEDIUM		ALSO USED AS CATALYST	EN204
KC101	CAR. ACTIVATED ALUMINA	AL2O3 93.6%. NA2O 0.30%				KC101
MS102	CAR. ALUMINA CATALYST	AL2O3 96	DRYING AGENT, DEHYDRATION		HIGH ACTIVITY ALUMINA CARRIER	MS102
CC339	CAR. ALUMINUM OXIDE (SINTERED)	AL2O3 96.SIO2 1.3.CAO 1.2			EXTRA-HIGH POROSITY, FINE PORE	CC339
CC325	CAR. ALUMINUM OXIDE (SINTERED)	AL2O3 96.SIO2 2.4.FE2O3 0.64			HIGH POROSITY, TIGHT STRUCTURE	CC325
CC337	CAR. ALUMINUM OXIDE (SINTERED)	AL2O3 96.SIO2 2.4.FE2O3 .64			EXTRA-HIGH POROSITY.FINE PORE	CC337
CC338	CAR. ALUMINUM OXIDE (SINTERED)	AL2O3 96.SIO2 2.4.FE2O3 .64			EXTRA-HIGH POROSITY, FINE PORE	CC338
CC327	CAR. ALUMINUM OXIDE (SINTERED)	AL2O3 96.SIO2 2.4. FE2O3 .64			MED. POROSITY, TIGHT STRUCTURE	CC327
GR101	CAT. PLATINUM ON ALUMINA	AL2O3 96.9%. NI 3%. PT 0.1%	DECOMP. OF HNO3 PLANT TAIL GAS	NOX REACT O2.CO.HYDROCARBONS	SULFUR IS POISON	GR101
DP101	CAR. ALUMINA HONEYCOMB. TORVEX	AL2O3 96%.MGAL2O4 3%.MULLITE 1	OXIDATION OF HYDROCARBON FUMES	REDUCTION NITROGEN OXIDE FUMES	STRONG. THERMALLY STABLE	DP101
MS105	CAR. ALUMINA CATALYST	AL2O3 97			HIGH ACTIVITY ALUMINA CARRIER	MS105
MS130	CAR. ALUMINA	AL2O3 97%	FLUID BED OPERATIONS			MS130
MS103	CAR. ALUMINA CATALYST	AL2O3 98			HIGH ACTIVITY ALUMINA CARRIER	MS103
MC203	CAR. ALUMINA. HARD	AL2O3 98.0% NA2O 0.1%	REFORMING. ISOMERIZATION	ALKYLATION, DEHYDRATION	TRUE DENSITY. SOLID 230	MC203
MS127	SOR. ALUMINA	AL2O3 98%. BALANCE MOISTURE				MS127
MS128.	SOR. ALUMINA	AL2O3 98%. BALANCE MOISTURE				MS128
MS101	CAR. ALUMINA CATALYST	AL2O3 99	DRYING AGENT, DEHYDRATION		ALUMINA IS ACTIVATED	MS101
CC340	CAR. ALUMINUM OXIDE (SINTERED)	AL2O3 99.NA2O .5.FE2O3 .04			EXTRA-HIGH POROSITY, FINE PORE	CC340
CC326	CAR. ALUMINUM OXIDE (SINTERED)	AL2O3 99.5.NA2O .45.FE2O3 .03			HIGH POROSITY, TIGHT STRUCTURE	CC326
CC101	CAR. ALUMINA. GAS REFORMING	AL2O3 99.5%. NA2O 0.45%	GAS REFORMING		RESISTANT TO STEAM AND H2	CC101
AC302	CAT. TABULATED ALUMINA	AL2O3 99.5%. SO3 .09. CAO .06%	LOW-SURFACE-AREA CATALYST	AGGREGATE(CASTABLE REFRACTORY)	AVAIL. AS CONVERTER DISCHARGE.	AC302
CC342	CAR. ALUMINUM OXIDE (SINTERED)	AL2O3 99.8.SIO2 .08.FE2O3 .04			EXTRA-HIGH POROSITY, FINE PORE	CC342
MS132	CAT.BARIUM CHLORIDE ON CARBON	BACL2 27%. BALANCE CARBON	REMOVAL OF HCL2 FROM CHLORINE	CONTAINING HYDROCARBON		MS132
BC101	SOR. ACTIVATED CARBON	CARBON	REMOVES TOXIC GASES FROM AIR			BC101
MS138	CAT. COBALT CATALYST	COO 10%. BAL. ACTIVATED AL2O3	HYDROGENATION CATALYST			MS138
MS135	CAT. COBALT CATALYST	COO 13% ON SIO2 TYPE BASE	OXO SYNTHESIS PROCESS + HYDRO-	GENATION REACTIONS.		MS135

TABLE A-3. (Continued)

MS139	CAT. COBALT CATALYST	COO 18%, BAL. ACTIVATED AL2O3				MS139
MS137	CAT. COBALT CATALYST	COO 20% ON SIO2 TYPE BASE	OXO PROCESS TO CONVERT ALDE-	HYDES TO ALCOHOLS.		MS137
MS133	CAT.COBALT OXIDE ON KIESELGUHR	COO 35%, BALANCE KIESELGUHR	HYDROGENATION CATALYST			MS133
MS109	CAT. COO, MOO3 ON ALUMINA	COO 3, MOO3 12, BAL. AL2O3	HYDROCARBON DESULFURIZATION			MS109
MS140	CAT. COBALT MOLYBDATE CATALYST	COO 3, MOO3 15, BALANCE AL2O3	DENITROGENATION + DESULFURIZA-	TION OF HYDROCARBONS.		MS140
MS110	CAT. COO, MOO3 ON ALUMINA	COO 3, MOO3 9, BALANCE ALUMINA	HYDROCARBON DESULFURIZATION			MS110
MS108	CAT. COO, MOO3 ON ALUMINA	COO 3, MOO3 4, BALANCE ALUMINA	HYDROCARBON DESULFURIZATION			MS108
MS107	CAT. COO, CUO ON ALUMINA	COO 5, CUO 5, BALANCE ALUMINA	HYDROGENATION, DECOMPOSITION		ACTIVATED ALUMINA CARRIER	MS107
MS136	CAT. COBALT CATALYST	COO 6% ON SIO2 TYPE BASE	OXO SYNTHESIS PROCESS + HYDRO-	GENATION REACTIONS.		MS136
MS106	CAT. COBALT OXIDE ON ALUMINA	COO 10, BALANCE ALUMINA	SYNTHESIS OF HYDROGEN SULFIDE			MS106
CA306	CAT.COO, MOO ON ALUMINA	COO,MOO,ALUMINA	HYDROGENATION			CA306
CA401	CAT. METAL OXIDES ON NA-AL2O3	CO-MO OXIDE, NI-MO OXIDE	HYDROGENATION; HYDRODESULFURI-	ZATION; HYDRODENITRIFICATION	1 TO 5-YEAR EXPECTED LIFE	CA401
GR426	CAT. CO ON REFRACTORY OXIDE	CO 33%, REFRACTORY OXIDE-BAL.	HYDROGENATION			GR426
MS134	CAT. COBALT ON KIESELGUHR	CO 39% BALANCE KIESELGUHR	OXO PROCESS + RELATED HYDROGEN	ATION REACTIONS.		MS134
GR425	CAT. PROMOTED COBALT	CO 60% IN OXIDIZED FORM	PRODUCTION OF PRIMARY AMINES	HYDROGENATION		GR425
MS141	CAT. CHROME ALUMINA	CR2O3 12, BAL. ACTIVATED AL2O3	DEHYDROGENATION			MS141
MS111	CAT. CHROME ALUMINA	CR2O3 12, MGO 2, BAL. ALUMINA	DEHYDROGENATION		ACTIVATED ALUMINA CARRIER	MS111
MC201	CAT. CHROME-ALUMINA	CR2O3 17.5% MIN., AL2O3 BAL.	DEHYDROGENATION; HYDROCRACKING	AROMATIZATION		MC201
MS146	CAT. CHROME ALUMINA	CR2O3 19,BAL. ACTIVATED AL2O3	DEHYDROGENATION OF BUTANE TO	BUTYLENE.		MS146
MS112	CAT. CHROMIUM OXIDE ON ALUMINA	CR2O3 19, BALANCE ALUMINA	DEHYDROGENATION OF BUTANE		ACTIVATED ALUMINA CARRIER	MS112
MS145	CAT. CHROME ALUMINA	CR2O3 19, BAL. ACTIVATED AL2O3	DEHYDROGENATION CATALYST FOR	FLUID BED USE.		MS145
MS144	CAT. CHROME ALUMINA	CR2O3 33, BAL. SILICATED AL2O3				MS144
MS152	CAT. COPPER CHROMITE	CR2O3 38, CUO 33, BAO 9.5			TABLETED CU-1106P (MS151)	MS152
MS150	CAT. COPPER CHROMITE	CR2O3 38, CUO 36, BAO 10			TABLETED CU-0401P (MS149)	MS150
MS151	CAT. COPPER CHROMITE	CR2O3 43.5, CUO 39, BAO 10				MS151
MS149	CAT. COPPER CHROMITE	CR2O3 44, CUO 41, BAO 11				MS149
MS153	CAT. COPPER CHROMITE	CR2O3 46, CUO 41, BAO 9				MS153
MS142	CAT. CHROME ALUMINA	CR2O3 58, BAL. ACTIVATED AL2O3	DEHYDROGENATION			MS142
MS154	CAT. COPPER CHROMITE	CR2O3 60, CUO 40				MS154
MS143	CAT. CHROME ALUMINA	CR2O3 9%,K2O 1.5%,BAL. AL2O3	DEHYDROGENATION			MS143
CA702	CAT. CHROMIUM OXIDE ON ALUMINA	CR 6-8%, AL2O3 BALANCE	STEAM-HYDROCARBON REFORMING			CA702
MS162	CAT. COPPER ON ALUMINA	CUCL2 10,BAL. ACTIVATED AL2O3P	CHLORINATION CATALYST			MS162
MS163	CAT. COPPER ON ALUMINA	CUCL2 10, BAL. ACTIVATED AL2O3	CHLORINATION CATALYST			MS163
MS160	CAT. COPPER ON ALUMINA	CUO 10%, BAL. ACTIVATED AL2O3	REMOVAL OF TRACE AMOUNTS OF O2	FROM GAS STREAMS.		MS160
MS113	CAT. COPPER CHROMITE	CUO 37, CR2O3 52	HYDROGENATION			MS113
MS157	CAT. COPPER CHROMITE	CUO 42, CR2O3 38			TABLETED CU-1800P (MS156)	MS157
MS156	CAT. COPPER CHROMITE	CUO 51, CR2O3 47				MS156
MS158	CAT. COPPER CHROMITE	CUO 56, CR2O3 41				MS158
MS164	CAT. COPPER	CUO 79%	CONVERT ALDEHYDES TO ALCOHOLS.	REMOVE TRACE GASES (O2,CO,H2)		MS164
MS148	CAT. COPPER CHROMITE	CUO 80, CR2O3 17			TABLETED CU-0202P (MS147)	MS148
MS147	CAT. COPPER CHROMATE	CUO 82,CR2O3 17				MS147
MS159	CAT. COPPER	CUO 99%	REMOVE O2 + H2 FROM GAS STREAM			MS159
GR405	CAT. COPPER OXIDE-ALUMINA	CUO, AMOUNT NOT SPECIFIED	LOW TEMP. CO CONVERSION		POISONED BY S2, HALOGEN COMPS	GR405
MS114	CAT. CUO ON ALUMINA	CUO 5, BALANCE ALUMINA	REMOVE O2,CO,H2 -GAS STREAM		INERT ALUMINA CARRIER	MS114
MS165	CAT. COPPER ON SILICA	CU2CO3 6%, BALANCE SIO2	DEHYDROGENATE ALCOHOLS TO	ALDEHYDES OR KETONES.		MS165
UC307	CAT. COPPER ON MOLECULAR SIEVE	CU 1.0	HYDRODEALKYLATION			UC307
MS161	CAT. COPPER ON ALUMINA	CU 7.7%, BAL. ACTIVATED AL2O3	CHLORINATION			MS161
CA105	CAT. CU,ZN,AL OXIDES ON BASE	CU,ZN,AL OXIDES	PRODUCE HYDROGEN			CA105
MS167	CAT. IRON OXIDE ON ALUMINA	FE2O3 20, BAL. ACTIVATED AL2O3	FLUID-BED HYDROGENATION CAT.			MS167
MS166	CAT. IRON OXIDE ON ALUMINA	FE2O3 20, BAL. ACTIVATED AL2O3	DEHYDROGENATION CATALYST			MS166
MS116	CAT. IRON OXIDE ON ALUMINA	FE2O3 5, BALANCE ALUMINA	AMMONIA DECOMPOSITION		INERT ALUMINA CARRIER	MS116
CA103	CAT. IRON-CHROMIUM OXIDES	FE2O3 77-81%, CR2O3 9-11%	PRODUCE HYDROGEN			CA103
CA601	CAT. MIXED OXIDES	FE,K,CA,AL OXIDES	SYNTHESIS OF AMMONIA		1-2 YEARS STORAGE)	CA601
MS115	COR. MAGNESIA	MGO 98				MS115
AC301	COR. ALUMINA, CATALYTIC GRADE	MGO,AL2O3,SIO2	REFORMING,CRACKING			AC301
AL102	COR. CORDIERITE	MGO,AL2O3,(5/2SIO2)	CARRIER IN NOX REACTOR	NOX FUME ABATEMENT EQUIPMENT		AL102
MS118	CAT. MNO2 ON ALUMINA	MNO2 19, BALANCE ALUMINA	OXIDATION		ACTIVATED ALUMINA CARRIER	MS118
MS171	CAT. MANGANESE OXIDE ON SILICA	MNO2 2%, BALANCE SIO2	OXIDATION CATALYST			MS171
MS175	CAT. MOLYBDENA ON ALUMINA	MOO3 10, BAL. ACTIVATED AL2O3	HYDRO + DEHYDROGENATION ,ALSO	HYDROFORMING.		MS175
MS173	CAT. MOLYBDENA ON ALUMINA	MOO3 10, BAL. ACTIVATED AL2O3	DEHYDROGENATION			MS173
MS174	CAT. MOLYBDENA ON ALUMINA	MOO3 11, BAL. ACTIVATED AL2O3	FLUID BED HYDROFORMING AND DE-	HYDROGENATION.		MS174
NL107	CAT. MO, CO, OXIDES ON ALUMINA	MOO3 12.5, COO 3.5	HYDRODESULFURIZATION			NL107
NL108	CAT. MO, CO, OXIDES ON ALUMINA	MOO3 12.5, COO 3.5	HYDRODESULFURIZATION			NL108
NL109	CAT. NI ON SIO2-AL2O3	MOO3 13, NI 4.5, SIO2 15	DESULFURIZATION			NL109
NL110	CAT. MO, NI ON ALUMINA	MOO3 14, NIO 2.9, SIO2 1.5	DESULFURIZATION			NL110
CY702	CAT. COBALT-MOLYBDENA CATALYST	MOO3 15.7, COO 3.0, NA2O .02	DESULFURIZATION, HYDROGENATION	REDUCES S2 AND N2 IN PETROLEUM		CY702
CY701	CAT. COBALT-MOLYBDENA CATALYST	MOO3 15.7, COO 3.2, NA2O .02	DESULFURIZATION, HYDROGENATION	REDUCES S2 AND N2 IN PETROLEUM		CY701
MS117	CAT. MOLYBDENUM SULFIDE	MOS2 44	DEHYDROGENATION, HYDROGENATION	DESULFURIZATION		MS117
MC202	CAT. COBALT-MOLYBDATE ON AL2O3	MO(O)3 14.6% CO(O) 3.2% AL2O3	DESULFURIZATION; HYDROGENATION		REGENERATES, STEAM-AIR	MC202
CY302	CAT. NI-MO	MO(O)3 19%, NIO 3.1%	HYDROGENATION; DESULFURIZATION		SUBSTRATE NOT SPECIFIED	CY302
DP102	COR. MULLITE HONEYCOMB, TORVEX	MULLITE 55%,SIO2 30%,AL2O3 15%	OXIDATION OF HYDROCARBON FUMES	REDUCTION NITROGEN OXIDE FUMES	STRONG, THERMALLY STABLE	DP102
MS194	CAT. NICKEL OXIDE ON ALUMINA	NIO2 5, BALANCE AL2O3 (INERT)	GAS REFORMING CATALYST			MS194
MS193	CAT. NICKEL OXIDE ON ALUMINA	NIO 10,BAL. AL2O3-SIO2 (INERT)	REFORM LOW MOLECULAR WEIGHT	HYDROCARBONS.		MS193
MS203	CAT. METAL OXIDES ON SILICA	NIO 10,CUO 1,BAL SIO2	HYDROGENATION CATALYST			MS203

TABLE A-3. (Continued)

MS187	CAT. NICKEL OXIDE ON ALUMINA	NIO 11. BAL. ACTIVATED AL2O3	HYDROGENATION OF DIOLEFINS TO	MONO-OLEFINS (SULFIDED FORM).		MS187
MS191	CAT. NICKEL OXIDE ON ALUMINA	NIO 14. BAL. ACTIVATED AL2O3	HYDROGENATIONS + AMINATIONS.			MS191
MS188	CAT. NICKEL OXIDE ON ALUMINA	NIO 15. BAL. ACTIVATED AL2O3	HYDROGENATION			MS188
MS190	CAT. NICKEL OXIDE, KIESELGUHR	NIO 18. BALANCE KIESELGUHR	HYDROGENATION REACTIONS			MS190
MS195	CAT. NICKEL OXIDE ON ALUMINA	NIO 1.5.BAL. AL2O3-SIO2(INERT)	USED IN GAS REFORMING			MS195
CA102	CAT. NICKEL ON REFRACTORY	NIO 20-40%; REFRACTORIES-BAL.	MFG. NH3, STEAM REFORMING			CA102
CA104	CAT. NICKEL OXIDE ON ALUMINA	NIO 30-70%; CARRIER BAL.	METHANATION			CA104
MS204	CAT. NICKEL OXIDE ON ALUMINA	NIO 3. BAL. ACTIVATED AL2O3	A GAS REFORMING CATALYST			MS204
MS202	CAT. METAL OXIDES ON ALUMINA	NIO 4.FE2O3 4.COO 4.AL2O3-SIO2	A DECOMPOSITION CATALYST			MS202
MS201	CAT. METAL OXIDES ON ALUMINA	NIO 4.FE2O3 4.COO 4.AL2O3-SIO2	DECOMPOSITION CATALYST			MS201
MS177	CAT.NICKEL OXIDE ON KIESELGUHR	NIO 55. BALANCE KIESELGUHR	HYDROGENATION CATALYST		MUST BE REDUCED BEFORE USE	MS177
MS192	CAT.NICKEL OXIDE ON ALUMINA	NIO 5.BAL. AL2O3-SIO2 (INERT)	REFORM LOW MOLECULAR WEIGHT	HYDROCARBONS.		MS192
MS205	CAT. NICKEL	NIO 5. BAL. INERT CUBES	GAS REFORMING CATALYST			MS205
MS200	CAT. NICKEL OXIDE ON ALUMINA	NIO 5. MG 1.2. BAL. AL2O3-SIO2	A GAS REFORMING CATALYST			MS200
MS182	CAT. NICKEL OXIDE, KIESELGUHR	NIO 66. BALANCE KIESELGUHR	HYDROGENATION CAT. (UNREDUCED)		MUST BE REDUCED BEFORE USE.	MS182
MS119	CAT. NICKEL OXIDE ON ALUMINA	NIO 32. BALANCE ALUMINA	HYDROGENATION		ACTIVE ALUMINA CARRIER	MS119
GR401	CAT. NICKEL	NI 15 TO 25% BALANCE-NOT GIVEN	PRODUCTION OF H2, NH3, CH3OH			GR401
UC306	CAT. NICKEL ON MOLECULAR SIEVE	NI 1.0	HYDRODEALKYLATION			UC306
MS189	CAT. NICKEL ON KIESELGUHR	NI 24 (REDUCED).BAL.KIESELGUHR	HYDROGENATION REACTIONS			MS189
MS208	CAT. NICKEL FLAKES (RUFERT)	NI 25% (NO OTHER DATA GIVEN)	HYDROGENATION OF FATTY OILS +	ACIDS,METHYL ESTERS, ETC.		MS208
MS186	CAT. NICKEL ON KIESELGUHR	NI 24. BALANCE KIESELGUHR	HYDROGENATION CAT. (ACTIVE BUT	STABLE).	NOT PYROPHORIC AS SHIPPED	MS186
MS207	CAT. (NYSEL)	NI 30(ACTIVE)(BASE PROPRIETARY	SUPERIOR SELECTIVITY IN THE	HYDROGENATION OF EDIBLE OILS.	CONSULT HARSHAW REP.,DETAILS	MS207
MS183	CAT. NICKEL ON KIESELGUHR	NI 30. BALANCE KIESELGUHR	FOR CERTAIN SPECIFIC PROBLEMS	IN HARDENING SOME FATTY OILS.	CONSULT HARSHAW REP. , DETAILS	MS183
GR407	CAT. NICKEL	NI 32% BALANCE-NOT GIVEN	METHANATION REACTIONS			GR407
GR406	CAT. NICKEL	NI 32% BALANCE-NOT GIVEN	METHANATION REACTIONS			GR406
GR432	CAT. ZR PROMOTED NI	NI 33%. BALANCE-NOT GIVEN	HYDROGENATION			GR432
MS199	CAT. NICKEL ON ALUMINA	NI 40%. BAL. ACTIVATED AL2O3	HYDROGENATION CATALYST		NOT PYROPHORIC AS SHIPPED	MS199
MS176	CAT. NICKEL HYDRATE.KIESELGUHR	NI 44(HYDRATE).BAL. KIESELGUHR	HYDROGENATION + METHANATION			MS176
MS198	CAT. NICKEL CATALYST	NI 46%. BASE MAT'L PROPRIETARY	HYDROGENATION CATALYST		ACTIVATE (REDUCTION)IN SITU	MS198
MS206	CAT. NICKEL-ALUMINUM	NI 49%. AL 49%	FOR FIXED BED,LOW-MODERATE	TEMP. HYDROGENATION REACTIONS.	MUST BE ACTIVATED IN SITU.	MS206
CA701	CAT. NICKEL OXIDE ON ALUMINA	NI 4-7%; AL2O3 BALANCE	STEAM-HYDROCARBON REFORMING			CA701
MS213	CAT.NICKEL/TUNGSTEN ON ALUMINA	NI 4.5.W 9.5. BALANCE AL2O3	DE-NITROGENATION/SULFURIZATION	.SATURATION AROMATIC COMPOUNDS	MILDLY ACIDIC	MS213
MS120	CAT. NI.W. ON ALUMINA,SULFIDED -	NI 4.5. W 9.5. S , BAL. AL2O3	HYDROGENATION, DENITROGENATION		MILDLY ACIDIC	MS120
MS196	CAT. NICKEL.ALUMINUM	NI 50%. AL 50%	PROCESS HYDROGENATIONS IN LOW	TO MODERATE TEMPERATURE RANGES	SUPPLIED INACTIVE	MS196
GR431	CAT. NICKEL ON KIESELGUHR	NI 54%. ZR 2%	HYDROGENATION			GR431
MS181	CAT. NICKEL ON KIESELGUHR	NI 55. BALANCE KIESELGUHR	HYDROGENATION CAT. (PARTIALLY	REDUCED + STABILIZED)		MS181
MS180	CAT. NICKEL ON KIESELGUHR	NI 59. BAL. KIESELGUHR			TABLETED FORM OF NI-0104P	MS180
MS179	CAT. NICKEL ON KIESELGUHR	NI 58. BALANCE KIESELGUHR	HYDROGENATION CATALYST		NOT PYROPHORIC AS SHIPPED	MS179
MS184	CAT. NICKEL ON KIESELGUHR	NI 60(REDUCED).BAL. KIESELGUHR	HYDROGENATION CATALYST		PYROPHORIC.SHIPPED IN LIQUID.	MS184
MS185	CAT. NICKEL ON KIESELGUHR	NI 60. BAL. KIESELGUHR	HYDROGENATION CAT.(HIGH PHYSI-	CAL STRENGTH).	NOT PYROPHORIC AS SHIPPED	MS185
MS178	CAT. NICKEL ON KIESELGUHR	NI 60. BALANCE KIESELGUHR	HYDROGENATION CAT. FOR TRICKLE	BED OR LIQUID PHASE REACTIONS.	NOT PYROPHORIC AS SHIPPED.	MS178
UA103	CAT. METAL ON METAL	NI 60%. CR 20%. FE 20%	COMBUSTION HYDROCARBON FUMES		OK IN REDUCING ATMOSPHERES	UA103
GR430	CAT. NICKEL ON KIESELGUHR	NI 65%.BALANCE KIESELGUHR	HYDROGENATION			GR430
MS212	CAT.NICKEL/TUNGSTEN ON ALUMINA	NI 6.W 19. BALANCE AL2O3	DE-NITROGENATION/SULFURIZATION	.SATURATION AROMATIC COMPOUNDS		MS212
MS209	CAT. NICKEL/TUNGSTEN	NI 6.W 19.BAL. SIO2/AL2O3	SULFIDE FORM,CRACKING FUNCTION	DE-NITROGENATION/SULFURIZATION		MS209
MS197	CAT. NICKEL CATALYST	NI 70%. BASE MAT'L PROPRIETARY	HYDROGENATION CATALYST		NOT PYROPHORIC AS SHIPPED	MS197
CA305	CAT. NI.CO.CR ON ALUMINA	NI.CO.CR.ALUMINA	SELECTIVE HYDROGENATION		5-YEAR EXPECTED LIFE	CA305
MS227	CAT. CHROMITE	NOT GIVEN (SEE COMMENTS)			SIMILAR TO MS225	MS227
MS225	CAT. CHROMITE	NOT GIVEN (SEE COMMENTS)	READY AS SHIPPED FOR METHANOL	SYNTHESIS.	REDUCED FORM OF MS125	MS225
MS226	CAT. CHROMITE	NOT GIVEN (SEE COMMENTS)			SIMILAR TO MS125	MS226
MS210	CAT. NICKEL/TUNGSTEN SULFIDE	NOT GIVEN (SEE COMMENTS)			SULFIDED FORM OF MS209	MS210
MS211	CAT. NICKEL/TUNGSTEN SULFIDE	NOT GIVEN (SEE COMMENTS)			SULFIDED FORM OF MS212	MS211
GR435	CAT. IRON OXIDE	NOT GIVEN	AMMONIA SYNTHESIS			GR435
GR402	CAT. NICKEL	NOT GIVEN	STEAM-HYDROCARBON REFORMING			GR402
CA304	CAT. PALLADIUM ON SPECIAL CRR.	NOT GIVEN	SELECTIVE HYDROGENATION		3-YEAR EXPECTED LIFE	CA304
GR436	CAT. IRON OXIDE	NOT GIVEN	AMMONIA DISSOCIATION			GR436
GR437	CAT. IRON OXIDE	NOT GIVEN	DEHYDROGENATION			GR437
GR419	CAT. NI-CO PROMOTED	NOT GIVEN	SELECTIVE HYDROGENATION			GR419
UC402	CAT. MOLECULAR SIEVE	NOT GIVEN	ALKYLATION			UC402
GR403	CAT. NICKEL ON ALUMINA	NOT GIVEN	STEAM-HYDROCARBON REFORMING			GR403
UC501	CAT. MOLECULAR SIEVE	NOT GIVEN	ISOMERIZATION PENTANE,HEXANE			UC501
GR412	CAT. IRON OXIDE	NOT GIVEN	REMOVAL OF S2 COMPDS FROM GAS			GR412
CA801	CAT. NOBLE METAL ON ALUMINA	NOT GIVEN	REMOVAL OF O2 FROM N2, NH3 AND	INERT GASES	SULFUR POISONS CATALYST	CA801
GR420	CAT. PALLADIUM ON ALUMINA	NOT GIVEN	SELECTIVE HYDROGENATION			GR420
GR421	CAT. PALLADIUM ON ALUMINA	NOT GIVEN	SELECTIVE HYDROGENATION			GR421
GR422	CAT. PALLADIUM ON ALUMINA	NOT GIVEN	SELECTIVE HYDROGENATION		POISONED BY SULFUR	GR422
GR416	CAT. PD ON ACTIVATED ALUMINA	NOT GIVEN	REMOVAL OF O2 FROM H2 STREAMS			GR416
GR417	CAT. PD ON ACTIVATED CARBON	NOT GIVEN	REMOVAL OF O2 FROM H2 STREAMS			GR417
XY101	CAT. PLATINUM ON ALUMINA COMB	NOT GIVEN	NOX FUMES, HNO3 TAILS GASES		SIMILAR TORVEX DP101	XY101
GR424	CAT. CO-MO	NOT GIVEN	SELECTIVE HYDROGENATION			GR424
MH101	CAT. PLATINUM ON TORVEX	NOT GIVEN	NOX, HYDROCARBON FUME REMOVAL		SEE DP101 AND DP102 FOR TORVEX	MH101
UA102	CAT. POROUS CERAMIC	NOT GIVEN	OXIDATION OF HYDROGEN (LOW T)		MFGR CAN SUPPLY MORE INFO.	UA102
NC101	CRR. ZEOLITE, SYNTHETIC	NOT GIVEN	ALKYLATION AND ISOMERIZATION	DRY REFORMER RECYCLE HYDROGEN		NC101
UA101	CAT. POROUS CERAMIC	NOT GIVEN	OXIDATION OF SO2, HYDROCARBONS	AT LOW TEMPERATURE	MFGR CAN SUPPLY MORE INFO.	UA101
GR427	CAT. CO ON KIESELGUHR	NOT GIVEN	HYDROGENATION			GR427

TABLE A-3. (Continued)

GR404	CAT. CHROMIUM-IRON OXIDE	NOT GIVEN	WATER-GAS SHIFT REACTION	REMOVAL OF S2 FROM GAS STREAMS		GR404
GR438	CAT. CR AND K PROMOTED IRON	NOT GIVEN	STYRENE PRODUCTION FROM ETHYL-	BENZENE; DEHYDROGEN.OF CUMENE		GR438
EN207	SOR. ACTIVATED BAUXITE	NOT GIVEN	OVERCOME SOURING OF HYDROCHNS	DRYING HALOGENATED HYDROCHNS		EN207
GR202	SOR. ACTIVATED CARBON	NOT GIVEN	DESULFURIZING GAS STREAMS	FIXED BED OPERATIONS		GR202
GR439	SOR. ACTIVATED CARBON	NOT GIVEN	REMOVAL OF S2 COMPDS FROM GAS			GR439
GR428	CAT.COPPER-CHROMITE	NOT GIVEN	MILD HYDROGENATION			GR428
GR301	CAT. COBALT-MOLY ON AL2O3	NOT GIVEN	HYDRODESULFURIZATION	HYDRODENITRIFICATION	LIMITED DROPPING DISTANCE,2FT.	GR301
GR429	CAT. BA PROMOTED CU2CR2O6	NOT GIVEN				GR429
GR411	CAT. CHROMIA-ALUMINA	NOT GIVEN	REMOVAL OF S2 COMPDS FROM GAS			GR411
GR409	CAT. CO-MO ON ALUMINA	NOT GIVEN	HYDRODESULFURIZATION			GR409
DG302	SOR. MOLECULAR SIEVE	NOT GIVEN	REMOVAL OF H2S, CO2, + ETHYL	MERCAPTAN FROM NATURAL GAS.		DG302
DG303	SOR. MOLECULAR SIEVE	NOT GIVEN	DEHYDRATION OF MOST FLUIDS			DG303
DG304	SOR. MOLECULAR SIEVE	NOT GIVEN	REMOVAL OF CO2 + H2O FROM AIR,	+ H2S + MERCAPTAN FROM L.P.G.		DG304
DG305	SOR. MOLECULAR SIEVE	NOT GIVEN	REFRIGERATION SYSTEMS			DG305
UC101	SOR. MOLECULAR SIEVE	NOT GIVEN	REMOVES SO2 AND OXIDES OF N2	FROM PROCESS STREAMS		UC101
UC102	SOR. MOLECULAR SIEVE	NOT GIVEN	REMOVES SO2 AND OXIDES OF N2	FROM STREAMS; DRIES SOUR GAS		UC102
UC201	SOR. MOLECULAR SIEVE	NOT GIVEN	SEPARATES NORMAL FROM BRANCHED	PARAFFINS		UC201
UC202	SOR. MOLECULAR SIEVE	NOT GIVEN	REMOVES H2O, CO2, H2S FROM GAS			UC202
UC203	SOR. MOLECULAR SIEVE	NOT GIVEN	DEHYDRATION			UC203
UC204	SOR. MOLECULAR SIEVE	NOT GIVEN	DEHYDRATION; DESSICANT			UC204
DG301	SOR. MOLECULAR SIEVE	NOT GIVEN	DRYING UNSATURATED HYDROCARBON	(ETHYLENE,PROPYLENE,BUTADIENE)		DG301
GR413	SOR. ZINC OXIDE	NOT GIVEN	REMOVES H2S FROM GAS STREAMS			GR413
GR414	CAT. CO-MO	NOT GIVEN	CONVERT S2 COMPDS TO H2S	HYDROGENATION OF OLEFINS		GR414
CA301	CAT. PALLADIUM ON ALUMINA	PALLADIUM 0.09-0.11%	HYDROGENATION		2-YEAR EXPECTED LIFE	CA301
CA303	CAT. PALLADIUM ON ALUMINA	PD 0.045-0.055%, AL2O3 BALANCE	HYDROGENATION		3-YEAR EXPECTED LIFE	CA303
CA302	CAT. PALLADIUM ON ALUMINA	PD 0.045-0.055%, AL2O3 BALANCE	HYDROGENATION		3-YEAR EXPECTED LIFE	CA302
GR415	CAT. PD ON REFRACTORY OXIDE	PD 0.05-0.4% REFRACT OXIDE-BAL	HYDROGENATION			GR415
MS216	CAT. PALLADIUM CATALYST	PD 0.3,BASE MAT ; PROPRIETARY	HYDROGENATION CATALYST(STABLE)			MS216
MS214	CAT. PALLADIUM ON ALUMINA	PD 0.3%, BAL. ACTIVATED AL2O3	HYDROGENATION CATALYST			MS214
MS215	CAT. PALLADIUM ON ALUMINA	PD 0.3%, BAL. ACTIVATED AL2O3	HYDROGENATION CATALYST		PD ACTIVATED + STABILIZED	MS215
UC302	CAT. PALLADIUM ON MOL. SIEVE	PD 0.5	BUTANE ISOMERIZATION			UC302
UC304	CAT. PALLADIUM ON MOL. SIEVE	PD 0.5	HYDROGENATION			UC304
UC305	CAT. PALLADIUM ON MOL. SIEVE	PD 0.5	HYDROGENATION			UC305
UC301	CAT. PALLADIUM ON MOL. SIEVE	PD 0.5	PENTANE-HEXANE ISOMERIZATION			UC301
GR433	CAT. PALLADIUM ON CARBON	PD 1 TO 10%, CARBON BALANCE	SLURRY-TYPE HYDROGENATION			GR433
GR434	CAT. PALLADIUM ON CARBON	PD 1 TO 10%, CARBON BALANCE	SLURRY-TYPE HYDROGENATION		MANUFACTURING NOT EQ. TO GR433	GR434
GR440	CAT. PALLADIUM ON SIO2-AL2O3	PD .05-.5,SIO2-AL2O3 BALANCE	HYDROGENATION			GR440
HC206	CAT. PALLADIUM ON CARBON	PD, 5-10, AS SPECIFIED	HYDROGENATION			HC206
CY401	CAT. PLATINUM	PT-AS SPECIFIED; FE .025%	REFORMING NAPHTHAS		COST DEPENDS ON PT CONTENT	CY401
UC303	CAT. PLATINUM ON MOL. SIEVE	PT 0.5	REFORMING			UC303
HC207	CAT. PLATINUM ON ALUMINA	PT 0.5%, AL2O3 BAL.	DEHYDROGENATION; HYDROGENATION	REFORMING; ISOMERIZATION	51 LBS./FT.3, LOADING DENSITY	HC207
HC208	CAT. PLATINUM ON ALUMINA	PT 0.5%, AL2O3 BAL.				HC208
CC316	CBR. SILICON CARBIDE	SIC 54,SIO2 26.5,AL2O3 11			LOW POROSITY, TIGHT STRUCTURE	CC316
CC311	CBR. SILICON CARBIDE	SIC 59,SIO2 27,AL2O3 11,NA2O 1			EXTRA-LOW POROSITY,TIGHT STRU.	CC311
CC320	CBR. SILICON CARBIDE	SIC 59,SIO2 27,AL2O3 11,NA2O 1			MED. POROSITY, TIGHT STRUCTURE	CC320
CC319	CBR. SILICON CARBIDE	SIC 77,SIO2 16,AL2O3 6,K2O .55			MEDIUM POROSITY,OPEN STRUCTURE	CC319
CC315	CBR. SILICON CARBIDE	SIC 77.5,SIO2 15,AL2O3 5.5			LOW POROSITY, OPEN STRUCTURE	CC315
CC317	CBR. SILICON CARBIDE	SIC 78,SIO2 15,AL2O3 6,CAO 1			MED. POROSITY,COARSE STRUCTURE	CC317
CC312	CBR. SILICON CARBIDE	SIC 78,SIO2 15,AL2O3 5.5			HIGH POROSITY, OPEN STRUCTURE	CC312
CC313	CBR. SILICON CARBIDE	SIC 80,SIO2 14,AL2O3 6,NA2O .7			HIGH POROSITY, TIGHT STRUCTURE	CC313
CC314	CBR. SILICON CARBIDE	SIC 80,SIO2 14,AL2O3 6,NA2O .7			LOW POROSITY, COARSE GRANULE	CC314
EN101	CAT. KAOLIN, CRACKING	SIO2 52.9%,AL2O3 45%,TIO2 1.7%	CRACKING		SUPERIOR, STEAM, THERMAL	EN101
HC204	CAT. MINERAL	SIO2 53%, AL2O3 45%			PROBABLY A NATURAL ZEOLITE	HC204
HC205	CAT. KAOLIN	SIO2 53%, AL2O3 45% FE2O3 0.3%				HC205
CY104	CAT. MOLECULAR SIEVE	SIO2 66, AL2O3 34, FE .12	CRACKING			CY104
DG210	CAT. SILICA/MAGNESIA	SIO2 70%, MGO 30% (DRY BASIS)	ESTERIFICATION REACTIONS; GAS/	OIL CRACKING (SUPPORT CAT.).	ALSO AVAILABLE AS A FLUID.	DG210
CY102	CAT. MOLECULAR SIEVE	SIO2 74,AL2O3 26,FE .05	CRACKING			CY102
CY103	CAT. MOLECULAR SIEVE	SIO2 74.4%; AL2O3 25%; FE .046	CRACKING			CY103
DG213	CAT. PELLETED SILICA/ALUMINA	SIO2 75,AL2O3 25,FE2O3 .05	DEHYDRATION CATALYST			DG213
CC331	CBR. SILICA	SIO2 81,AL2O3 15,NA2O 1,K2O 1			MED. POROSITY, TIGHT STRUCTURE	CC331
CY201	CAT. MOLECULAR SIEVE	SIO2 85, AL2O3 15, SO4 .3	CRACKING		SUR. AREA DEC. BY STEAM 1070F	CY201
CY101	CAT. MOLECULAR SIEVE	SIO2 86,AL2O3 14, FE .05	CRACKING			CY101
DG212	CAT. PELLETED SILICA/ALUMINA	SIO2 87,AL2O3 13,FE2O3 .05	DEHYDRATION CATALYST			DG212
DG202	CBR. SILICA-ALUMINA, ZEOLITE	SIO2 87, AL2O3 13	DEHYDRATION REACTIONS			DG202
DG211	CAT. SILICA/ALUMINA	SIO2 87, AL2O3 13, IMPURITY .3	REACTIONS REQ G AN ACID CATALY	ST (ALKYATION,ESTERIFICATION),	HIGH ACIDITY	DG211
HC209	CAT. SILICA-ALUMINA, SYNTHETIC	SIO2 87.3%; AL2O3 12.6	FIXED BED CRACKING;	ISOMERIZATION, ALSO CARRIER	REGENERABLE BY AIR	HC209
EP102	CBR. SILICA, DIATOMACEOUS	SIO2 92, AL2O3 5, FE2O3 1.8	CATALYST SUPPORT			EP102
CC328	CBR. SILICA	SIO2 93,AL2O3 6,BAO .4,MGO .33			HIGH POROSITY, TIGHT STRUCTURE	CC328
CC329	CBR. SILICA	SIO2 94,NA2O 2.6,CAO 2,MGO .81			LOW POROSITY, COARSE GRANULE	CC329
CC332	CBR. SILICA	SIO2 94,NA2O 4.5,CAO .59			MED. POROSITY, TIGHT STRUCTURE	CC332
CC333	CBR. SILICA	SIO2 95,CAO 4.95,AL2O3 .23			MED. POROSITY, TIGHT STRUCTURE	CC333
CC330	CBR. SILICA	SIO2 95,NA2O 3.4,AL2O3 .56			MED. POROSITY, COARSE GRANULE	CC330
DG208	CBR. SILICA GEL	SIO2 99.5,FE .02,AL2O3 .20	CARRIER / SUPPORT FOR CATALYST	USED IN THE CHEMICAL INDUSTRY.		DG208

TABLE A-1. (Continued)

DG209	CRR. SILICA GEL	SIO2 99.5,NAO2 .09,FE .02	CARRIER / SUPPORT FOR CATALYST	USED IN THE CHEMICAL INDUSTRY.		DG209
DG206	CRR. SILICA GEL	SIO2 99.5, FE .03, NA2O .02	CARRIER / SUPPORT FOR CATALYST	USED IN THE CHEMICAL INDUSTRY.		DG206
DG204	CRR. SILICA GEL	SIO2 99.5, NA2O .09, FE .02	CARRIER / SUPPORT FOR CATALYST	USED IN THE CHEMICAL INDUSTRY.		DG204
DG205	CRR. SILICA GEL	SIO2 99.6, FE .03, NA2O .02	CARRIER / SUPPORT FOR CATALYST	USED IN THE CHEMICAL INDUSTRY.		DG205
DG101	SOR. SILICA GEL	SIO2 99.71%	AIR AND GAS DRYING			DG101
DG117	SOR. SILICA GEL	SIO2 99.7, AL2O3 .10 TIO2 .09	DESSICANT		COLORED LT. BROWN	DG117
DG116	SOR. SILICA GEL	SIO2 99.7, AL2O3 .10, TIO2 .09	SELECTIVE ADSORPTION- USED FOR	LIQUID OR GAS PHASE SEPARATION		DG116
DG104	SOR.SILICA GEL	SIO2 99.7, AL2O3 .10, TIO2 .09	AIR AND GAS DRYING	POSSIBLE CATALYST OR CARRIER	VERY LIMITED USES IN LIQUIDS	DG104
DG118	SOR. SILICA GEL	SIO2 99.7, AL2O3 .10, TIO2 .09	SOURCE OF SIO2 IN CHEM REAX	ANTI-CAKING AGENT		DG118
DG119	SOR. SILICA GEL	SIO2 99.7, AL2O3 .10, TIO2 .09	INDICATING DESICCANT		CHNGES COLOR AS HUMIDITY CHNGS	DG119
DG120	SOR. SILICA GEL	SIO2 99.7, AL2O3 .10, TIO2 .09	INDICATING DESICCANT			DG120
DG121	SOR. SILICA GEL	SIO2 99.7, AL2O3 .10, TIO2 .09	INDICATING DESICCANT			DG121
DG122	SOR. SILICA GEL	SIO2 99.7, AL2O3 .10, TIO2 .09	INDICATING DESICCANT			DG122
DG123	SOR. SILICA GEL	SIO2 99.7, AL2O3 .10, TIO2 .09	DESICCANT		VERY POROUS	DG123
DG124	SOR. SILICA GEL	SIO2 99.7, AL2O3 .10, TIO2 .09	ANTI-CAKING AGENT			DG124
DG125	SOR. SILICA GEL	SIO2 99.7, AL2O3 .10, TIO2 .09	DESICCANT, POSSIBLE USE AS CAR	OR AS SELECTIVE ADSORBANT		DG125
DG126	SOR. SILICA GEL	SIO2 99.7, AL2O3 .10, TIO2 .09	USED TO INTRODUCE H2O TO SYSTM			DG126
DG127	SOR. SILICA GEL	SIO2 99.7, AL2O3 .10, TIO2 .09	CHROMATOGRAPHIC SEPARATION			DG127
DG102	SOR. SILICA GEL	SIO2 99.7, AL2O3 .10, TIO2 .09	AIR AND GAS DRYING	POSSIBLE CATALYST OR CARRIER	ALSO USED IN LIQUIDS	DG102
DG103	SOR. SILICA GEL	SIO2 99.7, AL2O3 .10, TIO2 .09	AIR AND GAS DRYING	POSSIBLE CATALYST OR CARRIER	ALSO USED IN LIQUIDS	DG103
DG113	SOR. SILICA GEL	SIO2 99.7, AL2O3 .10, TIO2 .09	SELECTIVE ADSORPTION- USED FOR	LIQUID OR GAS PHASE SEPARATION		DG113
DG105	SOR. SILICA GEL	SIO2 99.7, AL2O3 .10, TIO2 .09	AIR AND GAS DRYING	USED AS CAT IN LIQ PROCESSES		DG105
DG106	SOR. SILICA GEL	SIO2 99.7, AL2O3 .10, TIO2 .09	AIR AND GAS DRYING	WIDELY USED AS SOR WITH LIQS	SOME USE AS CAT IN LIQ PROCESS	DG106
DG107	SOR. SILICA GEL	SIO2 99.7, AL2O3 .10, TIO2 .09	AIR AND GAS DRYING	LIMITED USE WITH LIQUIDS	POSSIBLE USE AS CATALYST	DG107
DG108	SOR. SILICA GEL	SIO2 99.7, AL2O3 .10, TIO2 .09	AIR AND GAS DRYING	POSSIBLE CATALYST OR CARRIER		DG108
DG109	SOR. SILICA GEL	SIO2 99.7, AL2O3 .10, TIO2 .09	SELECTIVE ADSORPTION- USED FOR	LIQUID OR GAS PHASE SEPARATION		DG109
DG110	SOR. SILICA GEL	SIO2 99.7, AL2O3 .10, TIO2 .09	SELECTIVE ADSORPTION- USED FOR	LIQUID OR GAS PHASE SEPARATION		DG110
DG111	SOR. SILICA GEL	SIO2 99.7, AL2O3 .10, TIO2 .09	SELECTIVE ADSORPTION- USED FOR	LIQUID OR GAS PHASE SEPARATION		DG111
DG112	SOR. SILICA GEL	SIO2 99.7, AL2O3 .10, TIO2 .09	SELECTIVE ADSORPTION- USED FOR	LIQUID OR GAS PHASE SEPARATION		DG112
DG114	SOR. SILICA GEL	SIO2 99.7, AL2O3 .10, TIO2 .09	SELECTIVE ADSORPTION- USED FOR	LIQUID OR GAS PHASE SEPARATION		DG114
DG115	SOR. SILICA GEL	SIO2 99.7, AL2O3 .10, TIO2 .09	SELECTIVE ADSORPTION- USED FOR	LIQUID OR GAS PHASE SEPARATION		DG115
DG203	CRR. SILICA GEL	SIO2 99.7,FE .03,NA2O .02	CARRIER / SUPPORT FOR CATALYST	USED IN THE CHEMICAL INDUSTRY.		DG203
HS217	CAT. TITANIA ON ALUMINA	TIO2 80%, BALANCE AL2O3				HS217
HS122	CAT. VANADIA ON ALUMINA	V2O5 10, BALANCE ALUMINA	OXIDATION		HIGH ACTIVITY ALUMINA CARRIER	HS122
HS123	CAT. VANADIA ON ALUMINA	V2O5 10, BALANCE ALUMINA	OXIDATION		INERT ALUMINA CARRIER	HS123
HS219	CAT. VANADIUM OXIDE ON ALUMINA	V2O5 10, BALANCE AL2O3	OXIDATION			HS219
HS218	CAT. VANADIUM OXIDE ON ALUMINA	V2O5 10, BAL. ACTIVATED AL2O3	OXIDATION			HS218
HS121	CAT. VANADIA ON SILICA-ALUMINA	V2O5 10, BAL. SILICA-ALUMINA	OXIDATION			HS121
HS220	CAT. METAL OXIDES ON ALUMINA	V2O5 5, MOO3 5, ON INERT AL2O3	OXIDATION CATALYST			HS220
HS221	CAT. METAL OXIDES ON ALUMINA	V2O5 6, MOO3 3, ON INERT AL2O3	OXIDATION CATALYST			HS221
CY501	CAT. VANADIA-SILICA	V2O5 6.1, K2O 10.8, SIO2 62.	MFG OF PHTHALIC ANHYDRIDE			CY501
CA201	CAT. VANADIA, K-PROMOTED	V2O5 9-10%, K2O 14-15%	H2SO4 CONTACT CATALYST			CA201
CY601	CAT. VANADIA, SULFURIC ACID	V2O5 9.1%, K2O 10.15, FE .45%	CONTACT SULFURIC ACID PROCESS		SUBSTRATE NOT SPECIFIED	CY601
MN101	CAT. VANADIUM OXIDE	V2O5,CARRIER NOT SPECIFIED	H2SO4 CONTACT CATALYST		IMMUNE TO COMMON POISONS	MN101
MN102	CAT. VANADIUM OXIDE	V2O5,CARRIER NOT SPECIFIED	H2SO4 CONTACT CATALYST		FOR HIGH SO3 CONCENTRATIONS	MN102
MN103	CAT. VANADIUM OXIDE	V2O5,CARRIER NOT SPECIFIED	H2SO4 CONTACT CATALYST		RUGGED IN FIXED-BED OPERATION	MN103
HS226	CAT. TUNGSTEN OXIDE ON ALUMINA	WO3 10, BAL. ACTIVATED AL2O3	DEHYDRATION			HS226
HS222	CAT. TUNGSTEN OXIDE ON ALUMINA	WO3 10, BAL. ACTIVATED AL2O3				HS222
HS223	CAT. TUNGSTEN OXIDE	WO3 95% (APPROX.)	DEHYDRATION		SHOULD BE REDUCED BEFORE USE.	HS223
NL111	CAT. NICKEL-TUNGSTEN	W 16, NI 4, SO4 0.6 BAL. AL2O3	SPECIFIC HYDROTREATING			NL111
HS228	CAT. ZINC OXIDE	ZNO 100%	REMOVAL OF SULFUR FROM GAS	STREAMS.		HS228
HS230	CAT. METAL OXIDES ON ALUMINA	ZNO 10,CR2O3 10, BAL. AL2O3				HS230
HS231	CAT. ZINC OXIDE ON ALUMINA	ZNO 24 ,BAL. ACTIVATED AL2O3				HS231
HS229	CAT. METAL OXIDES ON ALUMINA	ZNO 38,CR2O3 25,/BALANCE AL2O3				HS229
HS125	CAT. CHROMITE	ZNO 76, CR2O3 23	SYNTHESIZE METHANOL		CATALYST REQUIRES REDUCTION	HS125
HS126	CAT. ZINC	ZNO 75, AL, MG, CA, CR OXIDES	DESULFURIZATION			HS126
HS232	CAT. ZINC ACETATE	ZN(C2H3O2)2 10%, BAL. CARBON	CONVERT ACETYLENE AND ACETIC	ACID TO VINYL ACETATE MONOMER		HS232
CC335	CRR. ZIRCON	ZRO2 56,SIO2 38,AL2O3 2,CAO .6			LOW POROSITY, TIGHT STRUCTURE	CC335
CC334	CRR. ZIRCON	ZRO2 60,SIO2 36,AL2O3 2,CAO .9			LOW POROSITY, COARSE GRANULE	CC334
CC336	CRR. ZIRCONIA	ZRO2 93,CAO 5,SIO2 .6,AL2O3 .5			MED. POROSITY, TIGHT STRUCTURE	CC336
HS233	CAT. ZIRCONIA	ZRO2 98%, BALANCE AL2O3				HS233
UC401						UC401

APPENDIX B

SORTED, SINGLE-VALUED SEARCH LISTS FOR SELECTED PROPERTIES

B-1

TABLE B-1. COST ($/TON) AND SECONDARY COMPOS.

CODE	COST	SECONDARY COMPOSITION
HS208	0	NONE
HS207	0	NONE
HS183	0	NONE
HS227	0	CR2O3
HS225	0	CR2O3 22%
HS226	0	CR2O3
GR435	0	NOT GIVEN
GR412	0	NOT GIVEN
GR424	0	NOT GIVEN
NL112	0	NONE
HS125	0	CR2O3 23%
HS132	0	NONE
HS203	0	CUO 1%
HS205	0	NONE
HS189	0	NONE
HS232	0	NONE
HS204	0	NONE
HS128	0	NONE
HS129	0	NONE
HS127	0	NONE
HS131	0	SIO2
HS162	0	NONE
HS174	0	NONE
HS195	0	NONE
HS179	0	NONE
HS194	0	NONE
HS192	0	NONE
HS182	0	NONE
HS200	0	MG 1.2%
HS193	0	NONE
HS126	0	NONE
HS123	0	NONE
HS201	0	FE2O3,4%, COO 4%
HS220	0	MOO3 5%
HS221	0	MOO3 3%
HS157	0	CR2O3
HS184	0	NONE
HS176	0	NONE
HS198	0	NONE
HS180	0	NONE
HS150	0	CUO
HS177	0	NONE
HS113	0	CUO 37%
HS152	0	CUO
HS206	0	AL 49%
HS148	0	CR2O3
HS196	0	NI,AL
MN103	0	NONE
CY401	0	FE .025%
DG120	0	NONE

```
DG117      0  NONE
DG118      0  NONE
CC327      0  FE203 .64
CC333      0  CAO
CC328      0  BAO .4
CC335      0  CAO .6
CC336      0  CAO
CC303      0  TIO2 .55
CC306      0  TIO2 1.8
CC332      0  NA2O
CC320      0  NA2O 1.
CC316      0  NOT GIVEN
CC312      0  NOT GIVEN
CC315      0  NOT GIVEN
CC319      0  K2O 0.55
CC305      0  TIO2 1.8
CC309      0  TIO2 2.2
CC310      0  TIO2 1.8
CC330      0  NA2O
CC329      0  NA2O
CC321      0  NONE
CC334      0  CAO .9
HS116      0  NONE
HS106      0  NONE
HS114      0  NONE
HS124      0  AL203
HS164      0  NOT GIVEN
CC341      0  MGO 3.
CC338      0  FE203 .64
HS228      0  NONE
HS181      0  NONE
HS229      0  CR203 25%
HS223      0  NOT GIVEN
HS188      0  NONE
HS185      0  NONE
HS115      0  NONE
HS233      0  AL203 2%
CC201      0  NONE
CC342      0  NONE
CC339      0  CAO 1.2
HS119      0  NONE
HS118      0  NONE
HS217      0  AL203 14%
HS231      0  NONE
HS144      0  NONE
HS159      0  NONE
HS163      0  NONE
HS230      0  CR203 10%
HS202      0  FE203,4%, COO 4%
HS101      0  NONE
HS122      0  NONE
HS107      0  COO 5%, CUO 5%
HS112      0  NONE
CC340      0  NA2O .5
HS166      0  NONE
HS111      0  MGO 2%
```

HS187	0	NONE
HS218	0	NONE
HS143	0	K20
HS219	0	NONE
HS178	0	NONE
HS141	0	NONE
HS133	0	NONE
HS135	0	NONE
HS224	0	NONE
HS175	0	NONE
HS161	0	NONE
HS142	0	NONE
HS209	0	NI 6%
HS222	0	NONE
HS214	0	NONE
HS146	0	NONE
HS137	0	NONE
HS139	0	NONE
HS191	0	NONE
HS136	0	NONE
DG105	0	NONE
HS210	0	NIS 6%
DG106	0	NONE
HS197	0	NONE
HS110	0	COO 3%
HS216	0	NONE
HS108	0	COO 3%
HS215	0	NONE
HS134	0	NONE
HS173	0	NONE
HS109	0	COO 3%
HS140	0	COO 3%
HS120	0	NI 4.5%
HS102	0	NONE
HS160	0	NONE
HS121	0	NONE
HS117	0	NONE
HS149	0	CUO
HS234	0	SI02 6%
HS211	0	NIS 6%
HS167	0	NONE
HS145	0	NONE
HS190	0	NONE
HS130	0	NONE
HS138	0	NONE
HS186	0	NONE
HS213	0	NI 4.5%
HS212	0	NI 6%
HS147	0	CR203
HS103	0	NONE
HS165	0	NONE
HS199	0	NONE
HS154	0	CUO
HS151	0	CUO
HS156	0	CR203
HS105	0	NONE

HS104	0	SIO2 6%
HS153	0	CUO
HS171	0	NONE
HS158	0	CR203
DG112	0	NONE
EN202	85	FE203 8.0
AC301	92	NONE
EN201	113	FE203 12%
EN208	122	FE203 3.5
EN203	122	TIO2 3.5
EN205	135	TIO2 3.0
EN101	143	TIO2 1.7%
EN204	145	TIO2 2.%
HC205	190	AL203 45%
EP102	230	FE203 1.8
EP101	230	FE203 1.8%
NL103	240	AL203 33%
AC101	245	NA20 .9%
EN206	250	TIO2 3.5
EN207	250	NOT GIVEN
RM101	260	NA20 .5
NL104	297	AL203 29%
NL101	315	AL203 13%
KC101	320	NA20 .3%
NL102	355	AL203 25%
CY105	370	FE .05
CY102	370	FE .05
CY103	370	FE .04
CY101	370	FE .05
CY501	370	K20 10.8%
CY104	370	FE .12
CY201	370	NONE
CY601	370	K20 10.1%
AC104	416	SIO2
NL105	425	AL203 32%
AC102	429	CACL2 9.3%
NL106	471	AL203 32%
AC103	491	COCL2
AC303	509	NICKEL FORMATE
AC302	555	CAO .06
GR404	572	NOT GIVEN
CA103	586	CR203 9-11%
DG102	620	NONE
DG108	640	NONE
HC204	650	AL203 45%
NL113	650	NA20 .09
DG210	660	MGO
CA601	694	K,CA,AL OXIDES
DG124	700	NONE
DG123	700	NONE
DG204	700	NONE
DG208	760	NONE
DG126	770	NONE
GR438	817	NOT GIVEN
GR437	817	NOT GIVEN
DG107	820	NONE

DG125	880	NONE
HC209	900	AL2O3 12.4%
CC304	940	CAO .53
CC324	1060	TIO2 .55
CC322	1060	NONE
CC325	1080	FE2O3 .64
CC101	1080	NA2O .45%
CC326	1080	NA2O
CC331	1100	NA2O 1, K2O 1
CC313	1100	NA2O 0.7
DG104	1100	NONE
DG109	1100	NONE
CC311	1140	NA2O 1.
GR413	1167	NOT GIVEN
CC307	1180	TIO2 1.9
DG205	1200	NONE
CC314	1220	NA2O 0.7
CC308	1220	TIO2 1.8
CC337	1220	FE2O3 .64
DG203	1240	NONE
DG119	1240	NONE
DG101	1240	NONE
CA201	1245	K2O 14-15%
CC302	1260	CAO .6, BAO .5
GR419	1270	NOT GIVEN
GR439	1320	NOT GIVEN
CC323	1340	NONE
CC317	1380	CAO 1.
DG103	1380	NONE
CA401	1400	CO-MO OXIDES
GR202	1435	NONE
HC203	1460	NA2O .1%
DG211	1500	AL2O3
DG206	1500	NONE
CA104	1510	NONE
CC318	1520	CAO 1.3
DG121	1600	NONE
GR405	1650	NONE
CA105	1667	ZN OXIDES
NL107	1680	COO 3.5%
GR403	1700	NOT GIVEN
CA306	1715	COO, MOO
NL108	1800	COO 3.5%
CA102	1810	NONE
CA303	1820	NONE
GR401	1840	NOT GIVEN
GR402	1840	NOT GIVEN
CY302	1900	NIO 3.1%
DG113	1900	NONE
NL109	1900	NI 4.5%
CY702	1900	COO3 3.0
CY701	1900	COO3 3.2
GR407	1920	NOT GIVEN
CC301	1920	CAO 1., NA2O .52
CA702	2000	NONE
DG122	2000	NONE

BC101	2000	NONE
CA302	2000	NONE
UC102	2000	NOT GIVEN
HC201	2000	NONE
CA701	2000	NONE
DG209	2000	NONE
NL110	2040	NIO 2.8%
MN101	2080	NONE
GR414	2090	NOT GIVEN
GR301	2090	MO
GR421	2090	NOT GIVEN
GR420	2090	NOT GIVEN
HC202	2100	COO 3.2%
MN102	2160	NONE
GR411	2200	NOT GIVEN
DG303	2200	NOT GIVEN
DG301	2300	NOT GIVEN
GR436	2400	NOT GIVEN
DG302	2400	NOT GIVEN
UC204	2460	NOT GIVEN
UC501	2600	NOT GIVEN
DG305	2640	NOT GIVEN
UC101	2670	NOT GIVEN
UC201	2670	NOT GIVEN
GR406	2700	NOT GIVEN
DG212	2700	NONE
GR409	2700	NOT GIVEN
UC203	2720	NOT GIVEN
DG213	2800	NONE
GR432	3000	ZR
DG304	3000	NOT GIVEN
CA305	3000	CO, CR
NL111	3240	NI 4%
UC202	3260	NOT GIVEN
CA301	3550	NONE
GR428	3700	NOT GIVEN
GR429	3700	BARIUM
DG201	3700	NONE
DG202	3700	NONE
CA304	4050	NONE
AL102	4350	NONE
GR426	4500	NONE
DG110	4800	NONE
DG116	4950	NONE
HC208	5300	NONE
GR430	5500	NONE
DG114	5500	NONE
DG127	5900	NONE
GR431	6200	ZR 3.0
NC101	6500	NOT GIVEN
AL101	7600	NONE
CA801	7750	NONE
GR427	8000	NOT GIVEN
GR425	8500	NONE
DG111	9800	NONE
GR101	10100	NI 3%

GR415	10800	NONE
GR440	10800	NONE
GR416	11800	NOT GIVEN
DG115	11900	NONE
GR417	12000	NOT GIVEN
GR422	12700	NOT GIVEN
DP102	15200	NONE
HC206	15600	CARBON
UA101	24000	NOT GIVEN
UC402	26000	NOT GIVEN
UC307	26000	MOLECULAR SIEVE STRUCTURE
UC306	26000	MOLECULAR SIEVE STRUCTURE
HC207	39000	NONE
DP101	45600	NONE
GR433	49400	NONE
GR434	49400	NONE
UC302	56000	MN 5.2, MOL. SIEVE STRUCTURE
UC301	56000	MOLECULAR SIEVE STRUCTURE
UA102	58000	NOT GIVEN
UC305	80000	MOLECULAR SIEVE STRUCTURE
UC304	80000	MOLECULAR SIEVE STRUCTURE
UC303	80000	MOLECULAR SIEVE STRUCTURE
UA103	85000	CR 20%, FE 20%
MB101	111000	NONE
XY101	250000	NOT GIVEN

TABLE B-2. SECONDARY COMPOSITION

CODE	SECONDARY COMPOSITION
HC209	AL203 12.4%
NL101	AL203 13%
HS217	AL203 14%
NL102	AL203 25%
NL104	AL203 29%
HS233	AL203 2%
NL106	AL203 32%
NL105	AL203 32%
NL103	AL203 33%
HC204	AL203 45%
HC205	AL203 45%
HS124	AL203
DG211	AL203
HS206	AL 49%
CC328	BAO .4
GR429	BARIUM
AC102	CACL2 9.3%
CC339	CAO 1.2
CC318	CAO 1.3
CC317	CAO 1.
CC301	CAO 1., NA2O .52
CC336	CAO
CC333	CAO
AC302	CAO .06
CC304	CAO .53
CC335	CAO .6
CC302	CAO .6, BAO .5
CC334	CAO .9
HC206	CARBON
AC103	COCL2
CY702	COO3 3.0
CY701	COO3 3.2
HC202	COO 3.5%
NL107	COO 3.5%
NL108	COO 3.5%
HS108	COO 3%
HS109	COO 3%
HS110	COO 3%
HS107	COO 5%, CUO 5%
CA306	COO, MOO
CA401	CO-MO OXIDES
CA305	CO, CR
HS230	CR203 10%
HS225	CR203 22%
HS125	CR203 23%
HS229	CR203 25%
CA103	CR203 9-11%
HS227	CR203
HS157	CR203
HS226	CR203

```
HS147  CR2O3
HS156  CR2O3
HS158  CR2O3
HS148  CR2O3
UA103  CR 20%, FE 20%
HS113  CUO 37%
HS152  CUO
HS154  CUO
HS151  CUO
HS150  CUO
HS153  CUO
HS149  CUO
HS203  CUO 1%
HS140  COO 3%
EN201  FE2O3 12%
EP102  FE2O3 1.8
EP101  FE2O3 1.8%
EN208  FE2O3 3.5
EN202  FE2O3 8.0
CC327  FE2O3 .64
CC338  FE2O3 .64
CC325  FE2O3 .64
CC337  FE2O3 .64
HS202  FE2O3,4%, COO 4%
HS201  FE2O3,4%, COO 4%
CY401  FE .025%
CY103  FE .04
CY102  FE .05
CY105  FE .05
CY101  FE .05
CY104  FE .12
CC319  K2O 0.55
CY601  K2O 10.1%
CY501  K2O 10.8%
CA201  K2O 14-15%
HS143  K2O
CA601  K,CA,AL OXIDES
HS111  MGO 2%
CC341  MGO 3.
DG210  MGO
HS200  MG 1.2%
UC302  MN 5.2, MOL. SIEVE STRUCTURE
UC307  MOLECULAR SIEVE STRUCTURE
UC301  MOLECULAR SIEVE STRUCTURE
UC305  MOLECULAR SIEVE STRUCTURE
UC304  MOLECULAR SIEVE STRUCTURE
UC303  MOLECULAR SIEVE STRUCTURE
UC306  MOLECULAR SIEVE STRUCTURE
HS221  MOO3 3%
HS220  MOO3 5%
GR301  MO
CC313  NA2O 0.7
CC314  NA2O 0.7
CC331  NA2O 1, K2O 1
CC311  NA2O 1.
CC320  NA2O 1.
```

CC330	NA2O
CC326	NA2O
CC329	NA2O
CC332	NA2O
NL113	NA2O .09
HC203	NA2O .1%
KC101	NA2O .3%
CC101	NA2O .45%
RM101	NA2O .5
CC340	NA2O .5
AC101	NA2O .9%
AC303	NICKFL FORMATE
NL110	NIO 2.8%
CY302	NIO 3.1%
HS211	NIS 6%
HS210	NIS 6%
G[illegible]101	NI 3%
HS120	NI 4.5%
HS213	NI 4.5%
NL109	NI 4.5%
NL111	NI 4%
HS209	NI 6%
HS212	NI 6%
HS196	NI,AL
HS174	NONE
HS167	NONE
HS145	NONE
HS190	NONE
HS130	NONE
HS138	NONE
HS186	NONE
HS195	NONE
HS179	NONE
HS194	NONE
HS103	NONE
HS165	NONE
HS199	NONE
HS192	NONE
HS182	NONE
HS183	NONE
HS105	NONE
HS193	NONE
HS171	NONE
HS126	NONE
DG112	NONE
CC321	NONE
AC301	NONE
HS123	NONE
HS116	NONE
HS106	NONE
HS114	NONE
NL112	NONE
HS208	NONE
HS132	NONE
HS228	NONE
HS181	NONE

```
HS207   NONE
HS188   NONE
HS185   NONE
HS115   NONE
HS184   NONE
CC201   NONE
CC342   NONE
HS176   NONE
HS119   NONE
CY201   NONE
HS118   NONE
HS198   NONE
HS231   NONE
HS144   NONE
HS159   NONE
HS163   NONE
HS180   NONE
HS205   NONE
DG102   NONE
DG108   NONE
HS101   NONE
HS122   NONE
HS177   NONE
HS112   NONE
DG124   NONE
DG123   NONE
DG204   NONE
DG208   NONE
DG126   NONE
DG107   NONE
DG125   NONE
HS189   NONE
HS166   NONE
CC322   NONE
HS232   NONE
HS187   NONE
HS218   NONE
HS204   NONE
HS219   NONE
DG104   NONE
DG109   NONE
HS178   NONE
DG205   NONE
HS141   NONE
HS133   NONE
DG203   NONE
DG119   NONE
DG101   NONE
HS135   NONE
HS224   NONE
CC323   NONE
HS175   NONE
DG103   NONE
HS161   NONE
GR202   NONE
HS142   NONE
```

HS128	NONE
DG206	NONE
CA104	NONE
HS222	NONE
DG121	NONE
GR405	NONE
HS214	NONE
HS146	NONE
HS137	NONE
CA102	NONE
CA303	NONE
HS139	NONE
DG113	NONE
HS191	NONE
HS136	NONE
DG105	NONE
HS129	NONE
CA702	NONE
DG122	NONE
BC101	NONE
CA302	NONE
HC201	NONE
CA701	NONE
DG209	NONE
DG106	NONE
MN101	NONE
HS197	NONE
MN103	NONE
MN102	NONE
DG212	NONE
DG213	NONE
HS216	NONE
HS127	NONE
CA301	NONE
HS215	NONE
DG201	NONE
DG202	NONE
CA304	NONE
AL102	NONE
GR426	NONE
DG110	NONE
DG116	NONE
HC208	NONE
GR430	NONE
DG114	NONE
DG127	NONE
AL101	NONE
CA801	NONE
GR425	NONE
DG111	NONE
HS134	NONE
GR415	NONE
GR440	NONE
DG115	NONE
DP102	NONE
HS173	NONE

DG120	NONE
DG117	NONE
HC207	NONE
DP101	NONE
GR433	NONE
GR434	NONE
DG118	NONE
HS102	NONE
HS160	NONE
HS121	NONE
HS117	NONE
HS162	NONE
MB101	NONE
HS223	NOT GIVEN
UC202	NOT GIVEN
GR435	NOT GIVEN
GR428	NOT GIVEN
GR407	NOT GIVEN
HS164	NOT GIVEN
CC316	NOT GIVEN
FN207	NOT GIVEN
CC312	NOT GIVEN
GR404	NOT GIVEN
UC102	NOT GIVEN
CC315	NOT GIVEN
GR403	NOT GIVEN
GR419	NOT GIVEN
GR439	NOT GIVEN
GR412	NOT GIVEN
NC101	NOT GIVEN
GR414	NOT GIVEN
GR438	NOT GIVEN
GR427	NOT GIVEN
GR421	NOT GIVEN
GR420	NOT GIVEN
GR401	NOT GIVEN
GR402	NOT GIVEN
GR411	NOT GIVEN
GR416	NOT GIVEN
DG303	NOT GIVEN
GR417	NOT GIVEN
GR422	NOT GIVEN
DG301	NOT GIVEN
GR436	NOT GIVEN
UA101	NOT GIVEN
UC402	NOT GIVEN
DG302	NOT GIVEN
UC204	NOT GIVEN
UC501	NOT GIVEN
DG305	NOT GIVEN
UC101	NOT GIVEN
UC201	NOT GIVEN
GR406	NOT GIVEN
GR437	NOT GIVEN
UA102	NOT GIVEN
GR409	NOT GIVEN

UC203	NOT GIVEN
GR424	NOT GIVEN
DG304	NOT GIVEN
GR413	NOT GIVEN
XY101	NOT GIVEN
HS104	SIO2 6%
AC104	SIO2
HS131	SIO2
HS234	SIO2 6%
EN101	TIO2 1.7%
CC310	TIO2 1.8
CC306	TIO2 1.8
CC305	TIO2 1.8
CC308	TIO2 1.8
CC307	TIO2 1.9
CC309	TIO2 2.2
EN204	TIO2 2.%
EN205	TIO2 3.0
EN203	TIO2 3.5
EN206	TIO2 3.5
CC303	TIO2 .55
CC324	TIO2 .55
CA105	ZN OXIDES
GR431	ZR 3.0
GR432	ZR

TABLE B-3. AVAILABLE SIZES

CODE	SIZE
AC101	1/4 INCH TO 8 MESH
AC102	1/2 TO 1/4 INCH
AC103	1/4 IN. TO 8 MESH
AC104	1/8 IN. + 1/4 IN. DIA. BALLS
AC301	1/4 INCH TO 8 MESH
AL101	CELLS 1,1/3,1/5 INCH
AL102	9IN. BY 9IN. BY 4IN.
CA102	1/2X1/2, 3/4X3/4 INCHES
CA103	3/8X1/4 AND 1/4X1/4 INCH
CA104	1/4X1/4, 3/8X1/4
CA105	1/4X1/4 AND 3/16X3/16 INCH
CA201	3/16 AND 1/4X1/4
CA301	1/8 INCH EXT., 4X8 MESH SPHERE
CA302	1/8 INCH; 4X8 MESH
CA303	1/8 INCH; 4X8 MESH
CA304	4X8 MESH
CA305	1/3 INCH
CA306	1/16X1/8 INCH
CA401	3/16 AND 1/4 IN. TABLETS
CA601	6-10 MM
CA701	5/8X1-1/2 INCH
CA702	5/8X1-1/2 INCH
CC101	3/16 TO 3/8 (SPHERE)
CY101	150 MICRONS MAX.
CY103	60 MICRONS
CY104	63 MICRONS
CY201	63 MICRONS
CY302	1/16 TO 1/8 INCH DIAM.
CY401	1/16 INCH DIAM.
CY501	95 PER CENT FINER THAN 149 MU.
CY601	5/16X1/4 INCH
CY701	.248 IN. LENGTH, .134 IN. DIA.
CY702	.189 IN. LENGTH, .069 IN. DIA.
DG101	3 TO 8 (TYLER SIEVE)
DG102	3 TO 8 (TYLER SIEVE)
DG103	8 TO 14 (TYLER SIEVE)
DG104	6 TO 16 (TYLER SIEVE)
DG105	8 TO 20 (TYLER SIEVE)
DG106	12 TO 28 (TYLER SIEVE)
DG107	6 TO 12 (TYLER SIEVE)
DG108	3 TO 9 (TYLER SIEVE)
DG109	28 TO 200 (TYLER SIEVE)
DG110	20 TO 65 (TYLER SIEVE)
DG111	35 TO 60 (TYLER SIEVE)
DG112	35 TO 60 (TYLER SIEVE)
DG113	60 TO 200 (TYLER SIEVE)
DG114	200 TO 325 (TYLER SIEVE)
DG115	100 TO 200 (TYLER SIEVE)
DG116	60 TO 200 (TYLER SIEVE)
DG117	8 (TYLER SIEVE)

DG118	80 (TYLER SIEVE)
DG119	6 TO 16 (TYLER SIEVE)
DG120	14 TO 20 (TYLER SIEVE)
DG121	3 TO 8 (TYLER SIEVE)
DG122	6 TO 16 (TYLER SIEVE)
DG123	3 TO 8 (TYLER SIEVE)
DG124	325 (TYLER SIEVE)
DG125	50 TO 200 (TYLER SIEVE)
DG126	100 (TYLER MESH)
DG127	250 (TYLER SIEVE)
DG201	61 MICRONS
DG202	3/16X3/16 INCH
DG203	3-200 MESH
DG204	ON 10 MESH(FINER SIZES ON REQ)
DG205	ON 4 MESH(FINER SIZES ON REQ.)
DG206	100-325 MESH
DG208	54 TO 65 MICRONS
DG209	54 TO 65 MICRONS
DG210	1/8X1/8 IN. OR 3/16X3/16 IN.
DG211	3/16 INCH DIAMETER
DG212	1/8X1/8 OR 3/16X3/16 CYLINDERS
DG213	1/8X1/8 OR 3/16X3/16 CYLINDERS
DG301	4-8 + 8-12 MESH; 3-5 MICRONS
DG302	4-8;8-12 + 20-50 MESH/3-5 MICR
DG303	4 MESH SIZES;8-30 MESH
DG304	4-8,8-12 MESH ;3-5 MICRONS
DG305	4-8,8-12,+ 14-30 MESH
DP101	CELLS 1/8,3/16,1/4,3/8,3/4 IN.
DP102	CELLS 1/8,3/16,1/4,3/8,3/4 IN.
EN101	3/6 TYLER MESH
EN201	10/20 MESH
EN202	4/8, 10/20, 10/30, 20/60 MESH
EN203	4/8, 4/10, 4/14, 10/20 MESH
EN204	2/4, 4/8, 4/10, 10/20, MESH
EN205	5/16X5/16 INCH
EN206	4/8, 4/10, 8/14 MESH
EN207	4/8, 8/14 MESH
EN208	4 TO 8 MESH
EP101	-1/2,+4 MESH
EP102	10 MESH
GR101	1/4X1/4,3/8X3/8 INCHES
GR202	4X6 MESH,8X30 MESH
GR301	3/16,1/8 INCH
GR401	3/4X3/4 OR 5/8X5/8 INCH RINGS
GR402	1/2 TO 3/4 INCH
GR403	5/8 TO 1-1/2 INCH
GR404	3/8X3/8 AND 1/4X1/4 INCH
GR405	1/4X1/8, 3/16X3/16 INCH
GR406	1/4X1/4 INCH
GR407	1/4X1/4 INCH
GR409	3/16X3/16 INCH
GR411	3/16X3/16, 1/4X1/4 INCH
GR412	1/4X1/4 INCH
GR413	1/8 TO 3/16 INCH
GR414	3/16X3/16 INCH
GR415	3/16X3/16 INCH

GR416	3/16X3/16 INCH
GR417	4X8 MESH
GR419	1/4 INCH
GR420	3/16X3/16 INCH
GR421	3/16X3/16 INCH
GR422	3/16X3/16, 3/16X3/8 INCH
GR424	1/4X1/4, 1/2X1/2 INCH
GR425	3/16X1/8, 1/4X3/16 INCH
GR426	1/4X1/4 INCH
GR427	3/16X1/8 INCH
GR428	3/16X3/16 INCH
GR430	3/16X1/8 INCH
GR431	3/16X1/8 INCH
GR432	1/4X1/4 INCH
GR433	95% THROUGH 100 MESH
GR434	95% THROUGH 100 MESH
GR435	2-8 MM
GR436	1/4, 1/2, 3/4, 1-INCH
GR437	1/16, 1/8 INCH
GR438	1/8 AND 3/16 INCH
GR439	4X6, 8X30 MESH
GR440	3/16 INCH
HC201	1/8X1/6 INCHES
HC202	1/8 AND 5/32 INCH DIAMETERS
HC203	3/32, 1/8, 5/32, 3/16 INCH
HC204	1/8 INCH
HC205	0.17-0.18 INCH DIAMETER
HC207	3/32 TO 5/32 INCH DIAM.
HC208	0.1 INCH DIAMETER
HC209	4X4 MM.
HS101	1/8 TO 1/4 INCH DIAMETER
HS102	1/8 TO 3/8 INCH DIAMETER
HS103	1/8 INCH DIAMETER
HS104	1/8 INCH DIAMETER
HS105	1/8 INCH DIAMETER
HS106	3/16 INCH DIAMETER
HS107	1/8 INCH DIAMETER
HS108	1/8 INCH DIAMETER
HS109	1/8 INCH DIAMETER
HS110	1/8 INCH DIAMETER
HS111	1/8 INCH DIAMETER
HS112	5/32 INCH DIAMETER
HS113	1/8 INCH DIAMETER
HS114	1/2 INCH DIAMETER
HS115	1/8 INCH DIAMETER
HS116	3/8 INCH DIAMETER
HS118	1/8 INCH DIAMETER
HS119	5/32 INCH DIAMETER
HS120	1/8 INCH DIAMETER
HS121	1/8 INCH DIAMETER
HS122	1/8 INCH DIAMETER
HS123	1/4 INCH DIAMETER
HS124	1/4 INCH DIAMETER
HS125	3/16 TO 3/8 INCH DIAMETER
HS129	80-325 MESH
HS130	76% <80 MICRONS,24%>80 MICRONS

HS132	4-6 MESH
HS133	3/16X3/16 INCH
HS134	3/16X3/16 INCH
HS135	4-8 MESH
HS136	4-8 MESH
HS137	4-8 MESH
HS138	1/8X1/8 INCH
HS139	1/8X1/8 INCH
HS140	1/8X1/8 INCH
HS141	1/8X1/8 INCH
HS142	1/8X1/8 INCH
HS143	1/8X1/8 INCH
HS144	1/8X1/8 INCH
HS145	0-80 MESH
HS146	1/8X1/8 INCH
HS148	1/8X1/8 INCH
HS150	1/8X1/8 INCH
HS152	1/8X1/8 INCH
HS159	1/8X1/8 INCH
HS160	1/8X1/8 INCH
HS161	1/4X1/4 INCH
HS163	1/8X1/8 INCH
HS164	1/8X1/8 INCH
HS165	4-10 MESH
HS166	1/8X1/8 INCH
HS167	MICROSPHEROIDAL
HS171	3-8 MESH
HS173	1/8X1/8 INCH
HS175	1/8X1/8 INCH
HS176	1/8,3/16,+1/4 IN.(DIA.,LENGTH)
HS177	1/8,3/16,+1/4 IN.(DIA.,LENGTH)
HS180	1/8X1/8 INCH
HS181	5/32 IN. DIA. X 1/8 IN. LONG
HS182	1/4 X 1/4 INCH
HS184	1/4X1/4 INCH
HS185	1/8,3/16,+1/4 IN.(DIA.+LENGTH)
HS186	1/16 INCH DIAMETER
HS187	1/8X1/8 INCH
HS188	1/8X1/8 INCH
HS190	5/32 INCH DIAMETER
HS191	1/8X1/8 INCH
HS192	3/8, 1/2, 3/4, + 1.0 INCH
HS193	1.0 INCH
HS194	1.0 INCH
HS195	3/4 INCH
HS196	325 MESH
HS197	1/8 + 3/16 INCH(DIA. + LENGTH)
HS198	5/32 + 7/32 IN.(DIA. + LENGTH)
HS199	1/16 INCH DIAMETER
HS200	1.0 INCH
HS201	1/4 INCH
HS202	1/8X1/8 INCH
HS203	4-6 MESH
HS204	2-1 MESH
HS205	1.0 INCH (SPEC. 102)
HS206	3/16X3/16 INCH

HS209	1/12 INCH DIAMETER
HS210	1/12 INCH DIAMETER
HS211	1/12 INCH DIAMETER
HS212	1/12 INCH DIAMETER
HS213	1/8 INCH DIAMETER
HS214	1/8X1/8 INCH
HS215	1/8X1/8 INCH
HS216	1/8X1/8 INCH
HS217	1/8X1/8 INCH
HS218	1/8X1/8 INCH
HS220	3/16 INCH DIAMETER
HS221	3/16 INCH DIAMETER
HS222	1/8X1/8 INCH
HS223	1/8X1/8 INCH
HS224	1/8X1/8 INCH
HS225	1/4X1/4 INCH
HS226	3/16,1/4,·3/8 INCH,DIA.,LENGTH
HS227	3/16,1/4,+3/8 INCH,DIA.,LENGTH
HS228	3/16 INCH DIAMETER
HS229	1/8X1/8 INCH
HS230	1/8X1/8 INCH
HS231	1/8X1/8 INCH
HS232	4-10 MESH
HS233	1/8X1/8 INCH
HS234	1/8X1/8 INCH
KC101	1/4X8 MESH, 1/4X1/2 INCH
MN101	0.2 IN.DIA. X 0.3 IN. LENGTH
MN102	0.2 IN.DIA. X 0.3 IN. LENGTH
MN103	2.8 IN.DIA. X 0.14 IN. THICK
NC101	1/8 1/16 PELLETS,5 MICRON POWD
NL107	1/16, 1/8 INCH
NL108	1/16, 1/8 INCH
NL109	1/16, 1/8 INCH
NL110	1/16, 1/8 INCH
NL112	EXTRUDED OR MICROSPHEROIDAL
RM101	1/2-1/4, 1/4-8 MESH,8-14 MESH
UC101	1/8, 1/16 INCH
UC201	1/16, 1/8 INCH
UC202	1/16, 1/8 INCH
UC203	1/16, 1/8 INCH
UC204	1/16, 1/8 INCH, 14X30,8X12 MSH
UC301	3/16X3/16
UC302	3/16X3/16 INCH
UC303	3/16X3/16 INCH
UC304	3/16X3/16 INCH
UC305	3/16X3/16 INCH
UC306	3/16X3/16 INCH
UC307	3/16X3/16 INCH
UC402	3/16X3/16 INCH
UC501	1/8X1/8 INCH

TABLE B-4. AVAILABLE SHAPES

CODE	SHAPE
AC101	GRANULES
AC102	GRANULES
AC103	GRANULAR
AC104	BALLS
AC301	GRANULAR
AC302	GRANULAR
AC303	GRANULAR
AL101	BLOCKS 8X8X2 INCH
AL102	EXTRUDED
CA102	CYLINDERS; RINGS
CA103	TABLETS
CA104	TABLETS; EXTRUSIONS
CA105	TABLETS
CA201	EXTRUSIONS AND TABLETS
CA301	EXTRUSIONS,SPHERES
CA302	EXTRUSIONS; SPHERES
CA303	EXTRUSIONS; SPHERES
CA304	SPHERES
CA305	SPHERES
CA306	EXTRUSIONS; TABLETS
CA401	EXTRUSIONS; TABLETS
CA601	GRANNULES
CA701	IRREGULAR PARTICLES
CA702	IRREGULAR PARTICLES
CC101	HOLLOW CYLINDER, SPHERES
CC301	PELLETS
CC302	PELLETS
CC307	GRANULES
CC308	GRANULES
CC314	GRANULES
CC321	GRANULES
CC322	GRANULES
CC329	GRANULES
CC330	GRANULES
CC334	GRANULES
CY101	POWDER
CY103	POWDER
CY104	POWDER
CY401	EXTRUSIONS
CY601	PELLETS
DG101	IRREGULAR GRANULES
DG102	GRANULAR
DG103	GRANULAR
DG104	GRANULAR
DG105	GRANULAR
DG106	GRANULAR
DG107	GRANULAR
DG108	GRANULAR
DG109	GRANULAR
DG110	GRANULAR

DG111	GRANULAR
DG112	GRANULAR
DG113	GRANULAR
DG114	GRANULAR
DG115	GRANULAR
DG116	GRANULAR
DG117	GRANULAR
DG118	GRANULAR
DG119	GRANULAR
DG120	GRANULAR
DG121	GRANULAR
DG122	GRANULAR
DG123	GRANULAR
DG124	GRANULAR
DG125	GRANULAR
DG126	GRANULAR
DG127	GRANULAR
DG201	POWDER, ALSO PELLETS
DG202	CYLINDRICAL PELLETS
DG203	GRANULES
DG204	GRANULES
DG205	GRANULES
DG206	GRANULES
DG208	GRANULES (MICROSPHEROIDAL)
DG209	GRANULES (MICROSPHEROIDAL)
DG210	EXTRUSION
DG211	EXTRUSION
DG212	PELLETS
DG213	PELLETS
DG301	SPHERES & GRANULES
DG302	SPHERES & GRANULES
DG303	SPHERES,GRANULES
DG304	SPHERES & GRANULES
DG305	SPHERES & GRANULES
DP101	BLOCKS 12 IN.SQ., 2 IN. THICK
DP102	BLOCKS 12 IN.SQ., 2 IN. THICK
EN101	CYLINDRICAL PELLETS
EN205	PELLETS
EN208	GRANULAR
GR101	TABLETS
GR202	GRANULES, PELLETS
GR301	EXTRUSIONS
GR401	RASCHIG RINGS, TABLETS, PELLET
GR402	CYLINDERS, RASCHIG RINGS
GR403	IRREGULAR LUMPS
GR404	TABLETS
GR405	TABLETS
GR406	PELLETS
GR407	TABLETS
GR409	TABLETS
GR411	TABLETS
GR412	TABLETS
GR413	SPHERICAL PILLS
GR414	TABLETS
GR415	TABLETS
GR416	TABLETS

GR417	GRANULES
GR419	EXTRUSIONS
GR420	PELLETS
GR421	PELLETS
GR422	PELLETS
GR424	TABLETS
GR425	PELLETS
GR426	TABLETS
GR427	POWDER, TABLETS
GR428	POWDER, TABLETS
GR430	TABLETS, POWDER
GR431	TABLETS, POWDER
GR432	TABLETS
GR433	POWDER, WET CAKES
GR434	POWDER, WET CAKES
GR435	GRANULES
GR436	SPHERES
GR437	EXTRUSIONS
GR438	EXTRUSIONS
GR439	PELLETS, GRANULES
GR440	SPHERES
HC201	PELLETS, CYLINDRICAL EXTRUSION
HC202	PELLETS, CYLINDRICAL EXTRUSION
HC203	PELLETS, CYLINDRICAL EXTRUSION
HC205	PELLETS, CYLINDRICAL
HC206	POWDER
HC207	PELLETS, CYLINDRICAL EXTRUSION
HC209	PELLETS
HS101	TABLET
HS102	TABLET
HS103	EXTRUSION
HS104	EXTRUSION
HS105	EXTRUSION
HS106	EXTRUSION, BLACK
HS107	TABLET, BLACK
HS108	TABLET
HS109	TABLET
HS110	TABLET
HS111	TABLET, GREEN
HS112	TABLET
HS113	TABLET
HS114	SPHERE, GRAYISH BLACK
HS115	TABLET, GRAY WHITE
HS116	SPHERE
HS117	POWDER, BROWN
HS118	TABLET, BLACK
HS119	TABLET
HS120	EXTRUSION
HS121	TABLET, ORANGE
HS122	TABLETS, ORANGE
HS123	SPHERE, ORANGE
HS124	TABLET
HS125	TABLET
HS126	1/8 IN. EXTRUSION
HS127	POWDER
HS128	POWDER

HS129	POWDER
HS130	POWDER (MICROSPHEROIDAL)
HS131	POWDER
HS132	GRANULE (EXTRUSION
HS133	TABLETS
HS134	TABLETS
HS135	GRANULES (BLACK)
HS136	GRANULES
HS137	GRANULES (BLACK)
HS138	TABLETS (BLACK)
HS139	TABLETS (BLACK)
HS140	TABLET
HS141	TABLETS (GREEN)
HS142	TABLETS (GREEN)
HS143	TABLETS
HS144	TABLETS (GREEN)
HS145	POWDER (MICROSPHERIODAL)
HS146	TABLETS (GREEN)
HS147	POWDER
HS148	TABLETS
HS149	POWDER
HS150	TABLETS
HS151	POWDER
HS152	TABLETS
HS153	POWDER
HS154	POWDER
HS156	POWDER
HS158	POWDER
HS159	TABLETS (BLACK)
HS160	TABLETS
HS161	TABLETS (WHITE)
HS162	POWDER
HS163	TABLETS
HS164	TABLETS (BLACK)
HS165	GRANULES
HS166	TABLETS
HS167	POWDER
HS171	GRANULES (BROWNISH-BLACK)
HS173	TABLETS (GRAY)
HS174	POWDER (MICROSPHEROIDAL-GRAY)
HS175	TABLETS (GRAY)
HS176	TABLETS (GREEN)
HS177	TABLETS (DARK GRAY)
HS178	GRANULES
HS179	POWDER
HS180	TABLETS
HS181	TABLETS
HS182	TABLETS
HS183	FLAKE (PROTECTED,HARDENED OIL)
HS184	TABLETS (PROTECTED IN LIQUID)
HS185	TABLETS
HS186	EXTRUSION
HS187	TABLETS (GRAY)
HS188	TABLETS
HS189	FLAKE (PROTECTED,HARDENED OIL)
HS190	EXTRUSION (GRAY)

HS191	TABLETS
HS192	SPHERES
HS193	SPHERES
HS194	SPHERES
HS195	RING (GRAY)
HS196	POWDER
HS197	TABLETS (ACTIVATED,STABLIZED)
HS198	TABLETS
HS199	EXTRUSION
HS200	SPHERES
HS201	SPHERES
HS202	TABLETS
HS203	GRANULES
HS204	GRANULES
HS205	CUBES
HS206	TABLETS
HS207	FLAKES(PROTECTED,60% STEARINE)
HS208	FLAKES (IN HARDENED OIL)
HS209	EXTRUSION
HS210	EXTRUSION
HS211	EXTRUSION
HS212	EXTRUSION
HS213	EXTRUSION
HS214	TABLETS
HS215	TABLETS
HS216	TABLETS
HS217	TABLETS (WHITE)
HS218	TABLETS (ORANGE)
HS219	SPHERES (ORANGE)
HS220	EXTRUSION
HS221	EXTRUSION
HS222	TABLETS (YELLOW TO WHITE)
HS223	TABLETS
HS224	TABLETS (GRAY WHITE)
HS225	TABLETS
HS226	TABLETS
HS227	TABLETS
HS228	EXTRUSION (WHITE)
HS229	TABLETS (GREENISH-BLACK)
HS230	TABLETS (GREY)
HS231	TABLETS (WHITE)
HS232	GRANULES
HS233	TABLETS (WHITE)
HS234	TABLETS
KC101	BALLS
MN101	EXTRUDED PELLETS
MN102	EXTRUDED PELLETS
MN103	TABLETS
NC101	PELLET, POWDER
NL107	EXTRUSION
NL108	EXTRUSION
NL109	EXTRUSION
NL110	EXTRUSION
RM101	IRREGULAR GRANULES
UC101	PELLETS
UC201	POWDER, PELLETS

UC202	POWDER, PELLETS
UC203	PELLETS, POWDER
UC204	PELLETS, BEADS, POWDER
UC301	TABLETS
UC302	TABLETS
UC303	TABLETS
UC304	TABLETS
UC305	TABLETS
UC306	TABLETS
UC307	TABLETS
UC402	TABLETS
UC501	TABLET,ANHYDROUS

TABLE B-5. CRUSHING STRENGTH IN LBS.

CODE	CRUSHING STRENGTH	COMMENTS
GR301	-0	APPEARS TO BE VERY FRAGILE
GR101	0	NOT .LT. 35 LBS DWL, 5% .LT.18
HS230	7	
HS157	8	
HS111	8	
HS180	9	
HS218	9	
HS231	9	
HS101	9	TO 25 (DEPENDING ON SIZE)
HS223	9	
HS199	9	
HS210	10	
CY401	10	
HS181	10	
HS197	10	
HS186	10	
HC202	10	
DG304	10	4-8 MESH ;16 LBS. 8-12 MESH
HS141	10	
HS173	10	
DG301	11	4-8 MESH ; 7 LBS. 8-12 MESH
HS163	11	
DG303	11	4-8 MESH ; 7 LBS. 8-12 MESH
DG302	11	4-8 MESH ; 7 LBS. 8-12 MESH
HS143	11	
HS222	11	
NL109	12	
HS113	12	
DG211	12	
HS150	12	
UC201	13	1/8 INCH PELLETS
NL108	13	
NL110	13	
HS187	13	
HS105	14	
HS107	14	
HS229	14	
HS209	14	
HS217	14	
NL111	14	
NL107	14	
CY702	14	
UC203	14	1/8 INCH PELLETS
HC201	15	MINIMUM
GR425	15	FOR 3/16X1/8 PELLETS
HS213	15	
HS134	15	
HC203	15	MINIMUM; 30.0 MAXIMUM
HS182	16	

HS202	16	
HS152	16	
HS176	17	
HS188	17	
HS212	17	
HS138	17	
HS133	17	
HS228	18	
HS211	18	
HS104	18	
HS166	18	
DG305	18	4-8 MESH ;10 LBS. 8-12 MESH
CY701	18	
HS164	19	
HS161	19	
HS175	19	
HS112	19	
GR438	20	
UC402	20	
UC204	21	1/8 INCH PELLETS
HS224	21	
HC208	21	
HS215	22	
HS191	22	
HS119	23	
HS121	23	
HS159	23	
HS214	24	
HS120	24	
HS233	24	
HS140	24	
HS109	24	
HS110	24	
HS108	24	
HS142	24	
UC202	24	1/8 INCH PELLETS
HS139	25	
HS115	25	
HS234	25	
HS177	25	DEPENDS ON SIZE (10-25 LBS.)
HS102	25	TO 63 (DEPENDING ON SIZE)
HS122	26	
NC101	26	
HS219	27	
HS160	28	
HS148	28	
UC501	30	
HS216	30	
HS103	31	
HS185	35	
HS118	35	
HS184	35	
HS146	35	
HS144	40	
HS198	40	
CY601	45	AVERAGE OF 25 PELLETS

HS190	45	
GR422	45	FOR 3/16X3/16 PELLETS
HS106	50	
KC101	50	
AC101	55	
HS116	60	
AC104	75	
GR401	90	FOR 5/8 IN. RINGS, SIDE AXIS
HS124	100	
HS206	100	
CC101	180	
EP101	200	LB./SQ.IN.,.THIS IS LOW.
EP102	200	LBS/SQ. IN.
HS114	240	

TABLE B-6. HARDNESS

CODE	HARDNESS	COMMENTS
HC203	5	MINIKNIFE EDGE, 1000G.
DG118	5	MOH SCALE
AL102	8	MOH SCALE
GR202	90	PER CENT
GR439	90	%
EN101	95	BALL MILL,INDEX
HC205	95	BALL MILL HARDNESS

TABLE B-7. PORE SIZE IN ANGSTROMS

CODE	PORE SIZE	COMMENTS
DG301	3	
UC203	3	
UC204	4	ALL FORMS
DG303	4	
UC101	4	
DG302	5	
UC201	5	
UC102	5	
NC101	9	
UC202	10	
DG304	10	
DG205	20	
DG203	22	
CC201	40	
KC101	50	
DG212	60	
DG208	67	
DG213	70	
NL101	70	
NL108	75	
NL110	75	
NL102	80	
HC209	82	
NL105	82	
NL106	90	
NL103	95	
NL104	95	
DG204	120	
DG202	143	
DG206	168	
DG209	200	
CC326	300	
CC101	4000	
CC327	12000	
CC325	20000	
CC333	25000	
CC328	50000	
CC335	60000	
CC304	60000	
CC324	70000	
CC331	110000	
CC318	110000	
CC336	120000	
CC303	120000	
CC306	120000	
CC323	130000	
CC311	130000	
CC313	150000	
CC332	150000	

CC320	160000
CC316	170000
CC302	200000
CC314	200000
CC312	210000
CC315	240000
CC319	250000
CC305	250000
CC309	260000
CC301	280000
CC310	300000
CC330	300000
CC329	330000
CC321	370000
CC322	390000
CC308	390000
CC334	440000
CC317	500000
CC307	580000

TABLE B-8. PORE VOLUME (CC/GM)

CODE	PORE VOLUME	COMMENTS
AC301	.015	
HS116	.060	
HS106	.070	
HS114	.070	
HS124	.120	
HS164	.140	
CC341	.140	
CC338	.140	
HS228	.140	
AC302	.175	
CC337	.180	
HS181	.180	
HS229	.180	
HS223	.190	
HS188	.200	
RM101	.200	MIN, 0.25 MAX
GR431	.200	
HS185	.200	
HS115	.200	
HS233	.210	
CC201	.210	
CC342	.220	
CC339	.230	
HS119	.230	
HS118	.230	
HS217	.250	
HS231	.250	
EN101	.250	
HS144	.260	
HS159	.260	
HS163	.260	
HS230	.280	
HS202	.280	
GR101	.280	CCL4 PORE VOL AT 800A
HS101	.280	MIN. .33 MAX.
HS122	.280	
HS107	.290	
GR430	.290	
HS112	.290	
DG205	.300	
CC340	.300	
HS166	.310	
HS111	.310	
HS187	.320	
HS218	.330	
HS143	.340	
DG202	.340	
HS219	.340	
HS178	.350	

HS141	.350	
HS133	.350	
HS135	.360	
HS224	.360	
HS175	.360	
HS161	.360	
HS142	.360	
HS209	.370	
HS222	.370	
HS214	.380	
HS146	.380	
HS137	.380	
HS139	.380	
NL111	.380	
HS191	.380	
HS136	.380	
DG105	.380	
HS210	.390	
DG103	.400	
DG115	.400	
DG106	.400	
HS197	.400	
HS110	.400	
DG116	.400	
HS216	.400	
HS108	.400	
HS215	.400	
HS134	.400	
HS173	.400	
HS109	.400	
HS140	.400	
HS120	.410	
HS102	.420	MIN. .51 MAX.
HS160	.420	
DG111	.430	AT 1750 F
DG108	.430	
DG109	.430	
DG110	.430	
DG102	.430	
DG107	.430	
DG101	.430	
DG104	.430	
HS121	.450	
DG203	.450	
DG114	.450	
HS117	.460	
NL107	.460	
HS149	.470	
HS234	.480	
HS211	.480	
HS167	.490	
HS145	.500	
NL109	.500	
HS190	.500	
HS130	.500	
NL110	.510	

HS138	.510	
KC101	.510	
NL108	.510	
HS186	.530	
HS213	.530	
CY701	.540	
HS212	.540	
CY702	.540	
HS147	.550	
NL105	.550	MIN., 0.60 MAX.
HS103	.560	
CY104	.570	
CY302	.600	
NL106	.600	MIN, 0.65 MAX.
CY201	.600	
DG201	.600	
HS165	.610	
NL113	.630	
NL104	.650	
DG210	.650	
NL103	.650	
GR439	.670	
GR202	.670	
HS199	.690	
HS154	.690	
DG213	.700	
DG125	.700	
CY105	.720	
CY101	.720	MINIMUM; .78 MAXIMUM
DG127	.750	
DG212	.750	
HS151	.760	
HS156	.760	
HS105	.770	
NL102	.800	MIN. 0.9 MAX.
NL101	.800	MIN. 0.85 MAX.
CY102	.840	MINIMUM; .92 MAXIMUM
CY103	.890	
HS104	.910	
HS153	.920	
HS171	.970	
DG211	1.000	
DG208	1.000	
DG204	1.040	
HS158	1.130	
DG113	1.150	
DG123	1.150	
DG112	1.150	
DG206	1.200	
DG209	1.700	

TABLE B-9. SURFACE AREA(SQ. METERS PER GRAM)

CODE	AREA	COMMENTS
DP101	0.00	(384 SQ.FT/CU.FT,1/8-IN.CELL)
DP102	0.00	(384 SQ.FT/CU.FT. 1/8-IN.CELL)
FP101	-0.00	SURFACE AREA EXTREMELY HIGH
AC301	.04	
CC301	.08	
HC204	.08	MIN. 0.1 MAX.
CC334	.09	
CC309	.09	
CC307	.11	
CC308	.11	
CC314	.14	
CC329	.14	
CC315	.15	
CC302	.16	
CC336	.16	
CC323	.16	
CC321	.17	
CC305	.19	
CC322	.19	
CC316	.19	
CC317	.20	
CC310	.20	
CC304	.21	
CC306	.22	
CC332	.23	
CC318	.25	
CC303	.27	
CC319	.27	
CC312	.29	
CC330	.30	
CC311	.30	
CC320	.31	
CC335	.31	
CC331	.34	
CC338	.34	
CC324	.38	
CC328	.45	
AC302	.50	
CC341	.55	
CC313	.57	
CC337	.58	
CC333	.64	
CC325	.74	
CC327	.87	
HS123	1.00	
HS220	1.00	
HS221	1.00	
HS193	1.00	
HS195	1.00	
HS136	1.00	

```
HS114       1.00
HS153       1.00
HS201       1.00
HS116       1.00
HS192       1.00
HS135       1.00
HS200       1.00
HS194       1.00
CC342       1.40
CC339       2.30
CC101       2.60
HS203       3.00
HS165       4.00
HS190       4.00
CC340       4.69
HS159       5.00
CC326       5.64
HS137       6.00
HS106       6.80
HS228       7.00
HS164       8.00
HS154      10.00
XY101      10.00
HS124      11.00
HS147      13.00
HS149      15.00
HS223      17.00
HS117      19.00
HS115      21.00
HS158      35.00
HS156      37.00
HS166      41.00
HS111      45.00
HC201      45.00  MIN.  70. MAX.
HS231      46.00
HS151      47.00
HS139      49.00
HS233      50.00
HS119      52.00
HS229      56.00
HS107      59.00
HS163      59.00
HS138      60.00
HS112      60.00
HS141      63.00
HS187      64.00
HS173      64.00
HS188      65.00
HS143      67.00
HS118      69.00
HS217      70.00
HS222      75.00
HS202      78.00
HS218      78.00
HC207      80.00
HS101      80.00  MIN. 100 MAX.
```

HC205	90.00	MINIMUM; 100 MAXIMUM
DG202	95.00	
EN101	95.00	
HS146	100.00	
HS145	100.00	
HS161	100.00	
HS167	105.00	
HS178	110.00	
HS122	115.00	
HS144	120.00	
HS181	130.00	
HS133	130.00	
HS197	132.00	
HS160	137.00	
HS121	139.00	
HS134	140.00	
HS191	140.00	
HS211	140.00	
HS230	141.00	
HS224	145.00	
HS128	150.00	
HC203	150.00	MINIMUM; 180 MAXIMUM
HS212	152.00	
GR430	155.00	TABLETS
HS199	160.00	
HS175	160.00	
HS110	160.00	
HS108	160.00	
HS142	160.00	
HS180	165.00	
HS185	165.00	
HS179	165.00	
HS109	166.00	
HS186	168.00	
EN201	175.00	
HS102	180.00	MIN. 200 MAX.
HS162	180.00	
HS216	180.00	
HS103	181.00	
HS213	184.00	
HS214	186.00	
HS120	194.00	
EN202	195.00	FOR 6% VOLATILE MATERIAL
HS140	200.00	
CY302	200.00	
HS215	200.00	
EN205	200.00	
HS130	200.00	
EN208	200.00	
CC201	200.00	FOR 6% VOLATILE MATERIAL
EN203	205.00	
AC101	210.00	
RM101	210.00	MIN, 240. MAX
EN206	210.00	
GR101	212.00	
HS210	212.00	

HS219	214.00	
NL111	215.00	
HS105	218.00	
CY501	220.00	
EN204	220.00	FOR 6% VOLATILE MATERIAL
HC208	227.00	
HS209	228.00	
HS131	240.00	
HS234	240.00	
CY702	255.00	
HS171	258.00	
CY701	258.00	
NL107	260.00	
NL106	270.00	
NL108	270.00	
NL110	270.00	
GR431	274.00	TABLETS
HS104	277.00	
NL105	280.00	
NL103	280.00	
DG206	285.00	
HC209	290.00	MINIMUM, 315 MAXIMUM
NL113	300.00	
DG112	300.00	
DG201	325.00	
HC202	330.00	
CY104	330.00	
DG113	340.00	
DG123	340.00	
DG204	350.00	
DG209	350.00	
NL104	350.00	
NL109	360.00	
KC101	380.00	
AC104	390.00	
DG213	400.00	
DG211	400.00	
NL102	440.00	
NC101	450.00	PELLET
CY102	450.00	MINIMUM; 600 MAXIMUM
CY101	500.00	MINIMUM; 650 MAXIMUM
DG212	500.00	
UC306	500.00	
CY105	500.00	
UC302	500.00	
UC304	500.00	
DG210	500.00	
UC303	500.00	
UC305	500.00	
UC301	500.00	
UC307	500.00	
NL101	520.00	
DG127	550.00	
UC501	550.00	GREATER THAN
UC402	550.00	
CY201	575.00	

DG105	600.00
DG208	600.00
DG205	600.00
DG125	600.00
DG116	700.00
DG115	700.00
DG108	750.00
DG103	750.00
DG106	750.00
DG102	800.00
DG107	800.00
DG101	800.00
DG109	800.00
DG110	800.00
DG111	800.00
DG104	800.00
DG114	800.00
GR439	800.00
DG203	800.00
GR202	850.00

TABLE B-10. BULK DENSITY(LBS. PER CU. FT)

CODE	DENSITY	COMMENTS
FP101	23	DRY,LOOSE
DG206	24	
DG112	24	
DG211	24	
CY102	24	MINIMUM, 30 MAX.
CA301	25	EXTRUSIONS,40 SPHERES
CA303	25	FOR EXTRUSIONS; 48. FOR SPHERE
CA302	25	FOR EXTRUSIONS; 40. FOR SPHERE
DG123	25	
DG209	25	
DG113	25	
CA104	25	MINIMUM, 68. MAXIMUM
NL102	26	
GR434	26	
NL101	26	
DG110	26	
GR433	26	
CY101	27	MINIMUM, 35 MAXIMUM
DG204	27	
CY103	27	
CY105	27	
DG208	28	
HS171	30	
HS137	30	
HS135	30	
HS151	30	
HS165	30	
DG127	31	
NL104	31	
HS136	31	
NL103	31	
NC101	32	PELLET
NL113	32	
CY201	32	
HS105	32	PACKED
DG201	32	
CY701	33	
CY702	33	
NL106	33	
CY104	33	
NL105	33	
HS104	33	PACKED
DG124	33	
CY501	34	
MN101	34	MIN, 51 MAX.
MN102	34	MIN, 51 MAX.
DP101	34	LB./CU.FT. FOR 1/8 IN. CELLS
GR202	34	
HS132	34	
CY302	35	

DP102	35	LB./CU.FT. FOR 1/8 IN. CELLS
CY401	35	POURED
NL109	35	
CY601	36	
UC302	37	
DG125	37	
HS203	37	
HS205	37	
HS158	38	
HS189	38	
DG212	39	
NL107	39	
HC209	39	
DG213	39	
CC328	40	
HS199	40	
CA304	40	
UC307	40	
UC306	40	
UC304	40	
UC303	40	
UC305	40	
DG202	41	
HS153	41	
HS156	41	
UC202	42	1/16 AND 1/8 INCH PELLETS
DG210	42	
HS103	42	PACKED
DG304	43	SPHERES ; 30 LBS, POWDER
DG203	43	
CC330	44	
HS101	44	TO 58 (DEPENDING ON SIZE)
UC402	44	
DG303	44	SPHERES ; 30 LBS. POWDER
DG302	44	SPHERES ; 30 LBS. POWDER
UC301	44	
DG111	44	
NL108	45	
NL110	45	
HS186	45	
DG102	45	
DG107	45	
HS232	45	
DG108	45	
DG103	45	
UC201	45	
UC102	45	
DG109	46	
UC204	46	1/16 INCH PELLETS
DG117	46	
DG105	46	
DG104	46	
DG114	46	
DG106	46	
DG301	46	SPHERES ;32LBS. POWDER
DG116	46	

DG115	46	
DG101	46	
UC501	46	
UC203	47	1/8 INCH PELLETS
DG121	47	
GR440	47	
HS102	47	TO 55 (DEPENDING ON SIZE)
KC101	47	
HC205	47	
DG120	47	
DG119	48	
DG122	48	
CA305	48	
CC329	48	
CC322	48	
DG118	48	
CA201	49	EXTRUSION, 56.TABLET
HS212	49	
CC312	49	
DG305	49	
EN101	49	
HC203	49	MINIMUM, 80 MAXIMUM
NL111	50	
DG205	50	
HS211	50	
RM101	50	MIN, 55. MAX
HS117	51	PACKED
HS190	51	
CC313	51	
GR401	52	
HS234	52	
CC323	52	
HS191	52	
CC333	52	
HS160	53	
AC104	53	
HS204	53	
HC202	53	PACKED;
HC208	53	
HS175	53	
HS128	54	
EN208	54	
HS149	54	
HS121	54	PACKED
CC332	54	
AC101	55	
HS214	55	
HS129	55	
EN206	55	
HS127	55	
EN204	55	FOR 6% VOLATILE MATERIAL
GR101	55	
HS147	55	
EN205	55	
HS215	55	
AC303	55	

EN203	55	FOR 6% VOLATILE MATERIAL
UC101	55	
EN201	56	
HC204	56	
HS161	56	
AC103	57	
EN202	57	FOR 6% VOLATILE MATERIAL
HS145	58	
GR421	58	
AC102	58	
HS222	59	
HS218	59	
HS210	59	
EN207	59	
HS141	60	
CA102	60	
HS112	60	PACKED
HS163	60	
CA103	60	
HS131	60	
CC331	60	
HC201	60	MIN. 69 MAX.
GR430	60	TABLETS
CC101	60	
HS138	60	
HS120	60	PACKED
HS140	60	
HS108	60	PACKED
HS162	60	
CC326	60	
GR431	60	TABLETS
HS122	60	PACKED
HS130	60	
CC325	61	
HS219	61	
HS173	61	
HS202	62	
HS166	62	
HS111	62	PACKED
HS224	63	
CC324	63	
HS109	64	PACKED
HS213	64	
CC320	64	
GR407	65	
DG126	65	
GR406	65	
HS178	65	
CC201	66	TAPPED. 54 LOOSE
CC319	66	
CC301	66	
CC318	67	
GR422	67	
HS107	67	PACKED
CC317	67	
HS143	67	

HS142	67	
HS187	68	
HS167	68	
CC308	68	
HS230	68	
HS174	68	
HS195	68	
CC315	69	
HS110	69	PACKED
HS216	70	
CC316	70	
HS118	70	PACKED
HS179	70	
HS134	70	
CC314	71	
HS133	71	
HS146	72	
HS154	73	
HS144	73	
HS115	74	PACKED
CC339	74	
GR413	75	
CC340	75	
HS194	75	
CC342	75	
CC311	75	
HS114	75	PACKED
HS231	75	
GR438	75	
HS228	75	
HS106	75	PACKED
HS192	75	
GR425	75	
HS116	75	PACKED
CC321	76	
CC337	76	
HS139	77	
HS182	77	
CC309	78	
HS200	78	
HS193	79	
GR420	80	
GR405	80	
HS126	80	
HS123	80	PACKED
CA105	80	
HS197	80	
CC338	80	
CC307	81	
HS201	82	
HS220	82	
CC310	82	
HS188	83	
HS221	83	
HS157	83	
CC304	84	

HS184	84	
CC341	84	
HS159	85	
HS176	85	
AC302	85	
HS198	85	
CC302	87	
HS119	87	PACKED
CC303	87	
HS217	87	
HS180	90	
HS181	90	
CC327	90	
CC306	95	
CC305	96	
CC334	96	
HS229	97	
CC335	98	
HS185	100	
HS150	101	
HS177	104	DEPENDS ON SIZE (94-104 1FT3)
HS164	105	
HS113	105	PACKED
HS223	108	
HS124	112	PACKED
HS152	113	
HS233	116	
CC336	121	
AC301	130	
HS206	135	
HS148	135	
CA601	135	REDUCED; 170 NON-REDUCED
HS196	137	

TABLE B-11. CRYSTALLINITY

CODE	CRYSTALLINITY
DG118	AMORPHOUS
DG301	CUBIC
EP102	DIATOMACEOUS SILICA
UC201	POWDER FORM-CUBIC
UC203	POWDER FORM-CUBIC
UC204	POWDER FORM-CUBIC
UC202	POWDER FORM-OCTAHEDRAL
DG304	BCC (DIAMOND STRUCTURE)
DG303	CUBIC
DG302	CUBIC
EP101	DIATOMACEOUS SILICA
HC203	GAMMA ALUMINA
GR101	GAMMA AL203

TABLE B-12. CRYSTALLITE SIZE (ANGSTROMS)

CODE	SIZE	COMMENTS
GR101	64	A

TABLE B-13. IGNITION LOSS (PER CENT)

CODE	LOSS	COMMENTS
HC204	.5	TO 2.0, 1400F
EP101	1.0	PER CENT ON IGNITION
EP102	1.0	
CY702	1.4	
CY701	1.5	
HC208	1.7	1400F
EN201	2.0	AT 1800F
EN208	2.0	AT 1800 F
HC201	2.0	1400F
EN101	2.0	AT 1800F
DG205	2.0	
NL111	2.5	AT 1200F
HC207	2.5	MAXIMUM
DG123	3.5	AT 1750 F
CY401	3.5	2300F
DG105	4.4	AT 1750 F
DG204	4.5	
DG112	4.5	AT 1750 F
DG209	5.0	
DG101	5.5	1750 DEG F
DG206	5.5	
DG108	5.5	AT 1750 F
DG103	5.5	AT 1750 F
DG104	5.5	AT 1750 F
DG106	5.5	AT 1750 F
DG107	5.5	AT 1750 F
DG121	5.6	AT 1750 F
DG120	5.6	AT 1750 F
DG119	5.6	AT 1750 F
DG203	6.0	
DG102	6.0	AT 1750 F
EN206	6.0	
DG114	6.0	AT 1750 F
EN202	6.0	ALSO AVAILABLE AS 2% VOLATILE
EN204	6.0	ALSO AVAILABLE AS 2% VOLATILE
KC101	6.0	
AC104	6.0	
DG109	6.0	AT 1750 F
DG110	6.0	AT 1750 F
EN203	6.0	ALSO AVAILABLE AS 2% VOLATILE
EN207	6.0	
AC101	6.5	1100C
DG115	6.5	AT 1750 F
DG111	6.5	
DG113	6.5	AT 1750 F
DG117	6.5	
DG122	6.5	AT 1750 F
DG124	6.5	AT 1750 F
DG116	6.5	
DG125	8.0	AT 1750 F

EN205	8.0	
AC103	8.5	
CY601	9.4	1470F
DG208	10.0	
DG118	10.0	AT 1750 F
DG210	12.0	
DG127	12.0	AT 1750 F
CY201	12.0	
AC303	12.1	
AC102	12.4	1100C
CY104	12.5	
NL106	13.0	
CY103	13.0	
NL105	13.0	
NL102	13.0	
NL103	13.0	
NL101	13.0	
NL104	13.0	
CY105	16.0	
CY101	16.0	
CY102	18.0	
DG126	68.0	AT 1750 F

TABLE B-14. PARTICLE DENSITY(LB. PER CU. FT.)

CODE	DENSITY	COMMENTS
HC209	62	
CC328	64	
CC337	67	
CC341	70	
CC340	71	
CC338	73	
CC312	74	
CC339	75	
CC313	78	
CC332	79	
CC330	79	
HC203	79	
CC342	80	
CC331	85	
CC333	89	
CC329	90	
CC325	94	
CC326	101	
CC319	102	
CC324	102	
CC318	103	
CC320	104	
CC322	104	
CC315	113	
CC308	115	
CC317	116	
CC314	117	
CC323	118	
CC303	125	
CC311	125	
CC321	126	
CC316	126	
CC310	127	
CC307	128	
CC301	130	
CC309	131	
CC304	136	
CC302	136	
DG118	137	
CC327	138	
AL102	143	
CC306	147	
CC305	153	
CC335	155	
CC334	174	
CC336	193	

TABLE B-15. MAXIMUM SERVICE TEMPERATURE (F)

CODE	TEMP.	COMMENTS
CA304	200	
CA301	250	
CA303	300	
GR421	350	
GR422	350	
AC101	350	REACTIVATION TEMP
GR420	350	
GR202	350	
GR405	375	
CA302	450	
CA305	600	
CA105	600	
CY302	700	
CA401	750	
GR301	750	MAXIMUM
CA306	750	
GR425	750	
CA104	750	
CA201	800	
GR407	825	
GR413	840	
GR411	850	
GR404	890	
CA601	950	
CY702	1000	
UC501	1000	MAXIMUM
CY701	1000	
CA103	1100	
GR438	1200	
AC104	1250	
UA103	1450	
NC101	1500	MAXIMUM
GR406	1500	
GR402	1850	
GR436	1850	
GR403	2200	
CA701	2300	
CA102	2400	
DP102	2460	IN AIR
GR101	2500	SHORT TERM,MAXIMUM
CA702	2600	
DP101	2700	IN AIR

TABLE B-16. ATTRITION (PER CENT)

CODE	ATTRITION	COMMENTS
MN101	-0.00	HIGHLY RESISTANT TO DISINTEGR.
MN102	-0.00	RESISTANT
EN101	.02	EXCELLENT RESISTANCE
CC324	.10	
KC101	.20	
CC335	.20	
CC305	.50	
CC311	.60	
CC326	.70	
CC320	.80	
CC310	.80	
CC316	1.00	
MN103	1.00	LOW ATTRITION LOSS
CC315	1.20	
CC321	2.00	
CC304	2.00	
CC302	2.00	
CC332	2.00	
CC325	3.00	
CC307	3.00	
CC308	3.00	
CC336	3.00	
CC319	3.00	
CC309	3.00	
CC317	3.00	
CC327	3.00	
CC314	3.00	
CC331	5.00	
CC323	5.00	
CC313	5.00	
CC322	5.00	
CC329	5.00	
CC318	5.00	
CC303	7.00	
CC306	7.00	
CC301	8.00	
CC312	8.00	
CC330	9.00	
CC333	9.00	
CY104	12.00	PER CENT, 1 HOUR
CC334	13.00	
CY201	14.00	PER CENT, 1 HOUR
CC328	16.00	
CY103	16.00	PER CENT, 1 HOUR
NL108	91.00	AFTER TUMBLING FOR ONE HOUR
NL111	91.00	AFTER TUMBLING FOR ONE HOUR
NL110	91.00	AFTER TUMBLING FOR ONE HOUR
NL107	92.00	AFTER TUMBLING FOR ONE HOUR
NL109	92.00	AFTER TUMBLING FOR ONE HOUR

APPENDIX C

SELECTED, TWO-VALUED COMPARISON TABLES

TABLE C-1. PORE VOLUME VS. PORE SIZE

CODE	PORE VOLUME	PORE SIZE
AC301	.015	0
HS116	.060	0
HS106	.070	0
HS114	.070	0
HS124	.120	0
HS164	.140	0
CC341	.140	0
CC338	.140	0
HS228	.140	0
AC302	.175	0
CC337	.180	0
HS181	.180	0
HS229	.180	0
HS223	.190	0
HS188	.200	0
RM101	.200	0
GR431	.200	0
HS185	.200	0
HS115	.200	0
HS233	.210	0
CC201	.210	40
CC342	.220	0
CC339	.230	0
HS119	.230	0
HS118	.230	0
HS217	.250	0
HS231	.250	0
EN101	.250	0
HS144	.260	0
HS159	.260	0
HS163	.260	0
HS230	.280	0
HS202	.280	0
GR101	.280	0
HS101	.280	0
HS122	.280	0
HS107	.290	0
GR430	.290	0
HS112	.290	0
DG205	.300	20
CC340	.300	0
HS166	.310	0
HS111	.310	0
HS187	.320	0
HS218	.330	0
HS143	.340	0
DG202	.340	143
HS219	.340	0
HS178	.350	0

HS141	.350	0
HS133	.350	0
HS135	.360	0
HS224	.360	0
HS175	.360	0
HS161	.360	0
HS142	.360	0
HS209	.370	0
HS222	.370	0
HS214	.380	0
HS146	.380	0
HS137	.380	0
HS139	.380	0
NL111	.380	0
HS191	.380	0
HS136	.380	0
DG105	.380	0
HS210	.390	0
DG103	.400	0
DG115	.400	0
DG106	.400	0
HS197	.400	0
HS110	.400	0
DG116	.400	0
HS216	.400	0
HS108	.400	0
HS215	.400	0
HS134	.400	0
HS173	.400	0
HS109	.400	0
HS140	.400	0
HS120	.410	0
HS102	.420	0
HS160	.420	0
DG111	.430	0
DG108	.430	0
DG109	.430	0
DG110	.430	0
DG102	.430	0
DG107	.430	0
DG101	.430	0
DG104	.430	0
HS121	.450	0
DG203	.450	22
DG114	.450	0
HS117	.460	0
NL107	.460	0
HS149	.470	0
HS234	.480	0
HS211	.480	0
HS167	.490	0
HS145	.500	0
NL109	.500	0
HS190	.500	0
HS130	.500	0
NL110	.510	75

HS138	.510	0
KC101	.510	50
NL108	.510	75
HS186	.530	0
HS213	.530	0
CY701	.540	0
HS212	.540	0
CY702	.540	0
HS147	.550	0
NL105	.550	82
HS103	.560	0
CY104	.570	0
CY302	.600	0
NL106	.600	90
CY201	.600	0
DG201	.600	0
HS165	.610	0
NL113	.630	0
NL104	.650	95
DG210	.650	0
NL103	.650	95
GR439	.670	0
GR202	.670	0
HS199	.690	0
HS154	.690	0
DG213	.700	70
DG125	.700	0
CY105	.720	0
CY101	.720	0
DG127	.750	0
DG212	.750	60
HS151	.760	0
HS156	.760	0
HS105	.770	0
NL102	.800	80
NL101	.800	70
CY102	.840	0
CY103	.890	0
HS104	.910	0
HS153	.920	0
HS171	.970	0
DG211	1.000	0
DG208	1.000	67
DG204	1.040	120
HS158	1.130	0
DG113	1.150	0
DG123	1.150	0
DG112	1.150	0
DG206	1.200	168
DG209	1.700	200

TABLE C-2. SURFACE AREA VS. PORE SIZE

CODE	AREA	SIZE
AC301	.04	0
CC301	.08	280000
HC204	.08	0
CC334	.09	440000
CC309	.09	260000
CC307	.11	580000
CC308	.11	390000
CC314	.14	200000
CC329	.14	330000
CC315	.15	240000
CC302	.16	200000
CC336	.16	120000
CC323	.16	130000
CC321	.17	370000
CC305	.19	250000
CC322	.19	390000
CC316	.19	170000
CC317	.20	500000
CC310	.20	300000
CC304	.21	60000
CC306	.22	120000
CC332	.23	150000
CC318	.25	110000
CC303	.27	120000
CC319	.27	250000
CC312	.29	210000
CC330	.30	300000
CC311	.30	130000
CC320	.31	160000
CC335	.31	60000
CC331	.34	110000
CC338	.34	0
CC324	.38	70000
CC328	.45	50000
AC302	.50	0
CC341	.55	0
CC313	.57	150000
CC337	.58	0
CC333	.64	25000
CC325	.74	20000
CC327	.87	12000
HS123	1.00	0
HS220	1.00	0
HS221	1.00	0
HS193	1.00	0
HS195	1.00	0
HS136	1.00	0
HS114	1.00	0
HS153	1.00	0
HS201	1.00	0

HS116	1.00	0
HS192	1.00	0
HS135	1.00	0
HS200	1.00	0
HS194	1.00	0
CC342	1.40	0
CC339	2.30	0
CC101	2.60	4000
HS203	3.00	0
HS165	4.00	0
HS190	4.00	0
CC340	4.69	0
HS159	5.00	0
CC326	5.64	300
HS137	6.00	0
HS106	6.80	0
HS228	7.00	0
HS164	8.00	0
HS154	10.00	0
XY101	10.00	0
HS124	11.00	0
HS147	13.00	0
HS149	15.00	0
HS223	17.00	0
HS117	19.00	0
HS115	21.00	0
HS158	35.00	0
HS156	37.00	0
HS166	41.00	0
HS111	45.00	0
HC201	45.00	0
HS231	46.00	0
HS151	47.00	0
HS139	49.00	0
HS233	50.00	0
HS119	52.00	0
HS229	56.00	0
HS107	59.00	0
HS163	59.00	0
HS138	60.00	0
HS112	60.00	0
HS141	63.00	0
HS187	64.00	0
HS173	64.00	0
HS188	65.00	0
HS143	67.00	0
HS118	69.00	0
HS217	70.00	0
HS222	75.00	0
HS202	78.00	0
HS218	78.00	0
HC207	80.00	0
HS101	80.00	0
HC205	90.00	0
DG202	95.00	143
EN101	95.00	0

HS146	100.00	0
HS145	100.00	0
HS161	100.00	0
HS167	105.00	0
HS178	110.00	0
HS122	115.00	0
HS144	120.00	0
HS181	130.00	0
HS133	130.00	0
HS197	132.00	0
HS160	137.00	0
HS121	139.00	0
HS134	140.00	0
HS191	140.00	0
HS211	140.00	0
HS230	141.00	0
HS224	145.00	0
HS128	150.00	0
HC203	150.00	0
HS212	152.00	0
GR430	155.00	0
HS199	160.00	0
HS175	160.00	0
HS110	160.00	0
HS108	160.00	0
HS142	160.00	0
HS180	165.00	0
HS185	165.00	0
HS179	165.00	0
HS109	166.00	0
HS186	168.00	0
EN201	175.00	0
HS102	180.00	0
HS162	180.00	0
HS216	180.00	0
HS103	181.00	0
HS213	184.00	0
HS214	186.00	0
HS120	194.00	0
EN202	195.00	0
HS140	200.00	0
CY302	200.00	0
HS215	200.00	0
EN205	200.00	0
HS130	200.00	0
EN208	200.00	0
CC201	200.00	40
EN203	205.00	0
AC101	210.00	0
RM101	210.00	0
EN206	210.00	0
GR101	212.00	0
HS210	212.00	0
HS219	214.00	0
NL111	215.00	0
HS105	218.00	0

CY501	220.00	0
EN204	220.00	0
HC208	227.00	0
HS209	228.00	0
HS131	240.00	0
HS234	240.00	0
CY702	255.00	0
HS171	258.00	0
CY701	258.00	0
NL107	260.00	0
NL106	270.00	90
NL108	270.00	75
NL110	270.00	75
GR431	274.00	0
HS104	277.00	0
NL105	280.00	82
NL103	280.00	95
DG206	285.00	168
HC209	290.00	82
NL113	300.00	0
DG112	300.00	0
DG201	325.00	0
HC202	330.00	0
CY104	330.00	0
DG113	340.00	0
DG123	340.00	0
DG204	350.00	120
DG209	350.00	200
NL104	350.00	95
NL109	360.00	0
KC101	380.00	50
AC104	390.00	0
DG213	400.00	70
DG211	400.00	0
NL102	440.00	80
NC101	450.00	9
CY102	450.00	0
CY101	500.00	0
DG212	500.00	60
UC306	500.00	0
CY105	500.00	0
UC302	500.00	0
UC304	500.00	0
DG210	500.00	0
UC303	500.00	0
UC305	500.00	0
UC301	500.00	0
UC307	500.00	0
NL101	520.00	70
DG127	550.00	0
UC501	550.00	0
UC402	550.00	0
CY201	575.00	0
DG105	600.00	0
DG208	600.00	67
DG205	600.00	20

DG125	600.00	0
DG116	700.00	0
DG115	700.00	0
DG108	750.00	0
DG103	750.00	0
DG106	750.00	0
DG102	800.00	0
DG107	800.00	0
DG101	800.00	0
DG109	800.00	0
DG110	800.00	0
DG111	800.00	0
DG104	800.00	0
DG114	800.00	0
GR439	800.00	0
DG203	800.00	22
GR202	850.00	0

TABLE C-3. SURFACE AREA VS. MAXIMUM TEMP.

CODE	AREA	TEMPERATURE
AC301	.04	0
CC301	.08	0
HC204	.08	0
CC334	.09	0
CC309	.09	0
CC307	.11	0
CC308	.11	0
CC314	.14	0
CC329	.14	0
CC315	.15	0
CC302	.16	0
CC336	.16	0
CC323	.16	0
CC321	.17	0
CC305	.19	0
CC322	.19	0
CC316	.19	0
CC317	.20	0
CC310	.20	0
CC304	.21	0
CC306	.22	0
CC332	.23	0
CC318	.25	0
CC303	.27	0
CC319	.27	0
CC312	.29	0
CC330	.30	0
CC311	.30	0
CC320	.31	0
CC335	.31	0
CC331	.34	0
CC338	.34	0
CC324	.38	0
CC328	.45	0
AC302	.50	0
CC341	.55	0
CC313	.57	0
CC337	.58	0
CC333	.64	0
CC325	.74	0
CC327	.87	0
HS123	1.00	0
HS220	1.00	0
HS221	1.00	0
HS193	1.00	0
HS195	1.00	0
HS136	1.00	0
HS114	1.00	0
HS153	1.00	0
HS201	1.00	0

HS116	1.00	0
HS192	1.00	0
HS135	1.00	0
HS200	1.00	0
HS194	1.00	0
CC342	1.40	0
CC339	2.30	0
CC101	2.60	0
HS203	3.00	0
HS165	4.00	0
HS190	4.00	0
CC340	4.69	0
HS159	5.00	0
CC326	5.64	0
HS137	6.00	0
HS106	6.80	0
HS228	7.00	0
HS164	8.00	0
HS154	10.00	0
XY101	10.00	0
HS124	11.00	0
HS147	13.00	0
HS149	15.00	0
HS223	17.00	0
HS117	19.00	0
HS115	21.00	0
HS158	35.00	0
HS156	37.00	0
HS166	41.00	0
HS111	45.00	0
HC201	45.00	0
HS231	46.00	0
HS151	47.00	0
HS139	49.00	0
HS233	50.00	0
HS119	52.00	0
HS229	56.00	0
HS107	59.00	0
HS163	59.00	0
HS138	60.00	0
HS112	60.00	0
HS141	63.00	0
HS187	64.00	0
HS173	64.00	0
HS188	65.00	0
HS143	67.00	0
HS118	69.00	0
HS217	70.00	0
HS222	75.00	0
HS202	78.00	0
HS218	78.00	0
HC207	80.00	0
HS101	80.00	0
HC205	90.00	0
DG202	95.00	0
EN101	95.00	0

HS146	100.00	0
HS145	100.00	0
HS161	100.00	0
HS167	105.00	0
HS178	110.00	0
HS122	115.00	0
HS144	120.00	0
HS181	130.00	0
HS133	130.00	0
HS197	132.00	0
HS160	137.00	0
HS121	139.00	0
HS134	140.00	0
HS191	140.00	0
HS211	140.00	0
HS230	141.00	0
HS224	145.00	0
HS128	150.00	0
HC203	150.00	0
HS212	152.00	0
GR430	155.00	0
HS199	160.00	0
HS175	160.00	0
HS110	160.00	0
HS108	160.00	0
HS142	160.00	0
HS180	165.00	0
HS185	165.00	0
HS179	165.00	0
HS109	166.00	0
HS186	168.00	0
EN201	175.00	0
HS102	180.00	0
HS162	180.00	0
HS216	180.00	0
HS103	181.00	0
HS213	184.00	0
HS214	186.00	0
HS120	194.00	0
EN202	195.00	0
HS140	200.00	0
CY302	200.00	700
HS215	200.00	0
EN205	200.00	0
HS130	200.00	0
EN208	200.00	0
CC201	200.00	0
EN203	205.00	0
AC101	210.00	350
RM101	210.00	0
EN206	210.00	0
GR101	212.00	2500
HS210	212.00	0
HS219	214.00	0
NL111	215.00	0
HS105	218.00	0

CY501	220.00	0
FN204	220.00	0
HC208	227.00	0
HS209	228.00	0
HS131	240.00	0
HS234	240.00	0
CY702	255.00	1000
HS171	258.00	0
CY701	258.00	1000
NL107	260.00	0
NL106	270.00	0
NL108	270.00	0
NL110	270.00	0
GR431	274.00	0
HS104	277.00	0
NL105	280.00	0
NL103	280.00	0
DG206	285.00	0
HC209	290.00	0
NL113	300.00	0
DG112	300.00	0
DG201	325.00	0
HC202	330.00	0
CY104	330.00	0
DG113	340.00	0
DG123	340.00	0
DG204	350.00	0
DG209	350.00	0
NL104	350.00	0
NL109	360.00	0
KC101	380.00	0
AC104	390.00	1250
DG213	400.00	0
DG211	400.00	0
NL102	440.00	0
NC101	450.00	1500
CY102	450.00	0
CY101	500.00	0
DG212	500.00	0
UC306	500.00	0
CY105	500.00	0
UC302	500.00	0
UC304	500.00	0
DG210	500.00	0
UC303	500.00	0
UC305	500.00	0
UC301	500.00	0
UC307	500.00	0
NL101	520.00	0
DG127	550.00	0
UC501	550.00	1000
UC402	550.00	0
CY201	575.00	0
DG105	600.00	0
DG208	600.00	0
DG205	600.00	0

DG125	600.00	0
DG116	700.00	0
DG115	700.00	0
DG108	750.00	0
DG103	750.00	0
DG106	750.00	0
DG102	800.00	0
DG107	800.00	0
DG101	800.00	0
DG109	800.00	0
DG110	800.00	0
DG111	800.00	0
DG104	800.00	0
DG114	800.00	0
GR439	800.00	0
DG203	800.00	0
GR202	850.00	350

TABLE C-4. BULK DENSITY VS. PARTICLE DENSITY

CODE	BULK DENSITY	PARTICLE DENSITY
EP101	23	0
DG206	24	0
DG112	24	0
DG211	24	0
CY102	24	0
CA301	25	0
CA303	25	0
CA302	25	0
DG123	25	0
DG209	25	0
DG113	25	0
CA104	25	0
NL102	26	0
GR434	26	0
NL101	26	0
DG110	26	0
GR433	26	0
CY101	27	0
DG204	27	0
CY103	27	0
CY105	27	0
DG208	28	0
HS171	30	0
HS137	30	0
HS135	30	0
HS151	30	0
HS165	30	0
DG127	31	0
NL104	31	0
HS136	31	0
NL103	31	0
NC101	32	0
NL113	32	0
CY201	32	0
HS105	32	0
DG201	32	0
CY701	33	0
CY702	33	0
NL106	33	0
CY104	33	0
NL105	33	0
HS104	33	0
DG124	33	0
CY501	34	0
MN101	34	0
MN102	34	0
DP101	34	0
GR202	34	0
HS132	34	0

CY302	35	0
DP102	35	0
CY401	35	0
NL109	35	0
CY601	36	0
UC302	37	0
DG125	37	0
HS203	37	0
HS205	37	0
HS158	38	0
HS189	38	0
DG212	39	0
NL107	39	0
HC209	39	62
DG213	39	0
CC328	40	64
HS199	40	0
CA304	40	0
UC307	40	0
UC306	40	0
UC304	40	0
UC303	40	0
UC305	40	0
DG202	41	0
HS153	41	0
HS156	41	0
UC202	42	0
DG210	42	0
HS103	42	0
DG304	43	0
DG203	43	0
CC330	44	79
HS101	44	0
UC402	44	0
DG303	44	0
DG302	44	0
UC301	44	0
DG111	44	0
NL108	45	0
NL110	45	0
HS186	45	0
DG102	45	0
DG107	45	0
HS232	45	0
DG108	45	0
DG103	45	0
UC201	45	0
UC102	45	0
DG109	46	0
UC204	46	0
DG117	46	0
DG105	46	0
DG104	46	0
DG114	46	0
DG106	46	0
DG301	46	0

DG116	46	0
DG115	46	0
DG101	46	0
UC501	46	0
UC203	47	0
DG121	47	0
GR440	47	0
HS102	47	0
KC101	47	0
HC205	47	0
DG120	47	0
DG119	48	0
DG122	48	0
CA305	48	0
CC329	48	90
CC322	48	104
DG118	48	137
CA201	49	0
HS212	49	0
CC312	49	74
DG305	49	0
EN101	49	0
HC203	49	79
NL111	50	0
DG205	50	0
HS211	50	0
RM101	50	0
HS117	51	0
HS190	51	0
CC313	51	78
GR401	52	0
HS234	52	0
CC323	52	118
HS191	52	0
CC333	52	89
HS160	53	0
AC104	53	0
HS204	53	0
HC202	53	0
HC208	53	0
HS175	53	0
HS128	54	0
EN208	54	0
HS149	54	0
HS121	54	0
CC332	54	79
AC101	55	0
HS214	55	0
HS129	55	0
EN206	55	0
HS127	55	0
EN204	55	0
GR101	55	0
HS147	55	0
EN205	55	0
HS215	55	0

AC303	55	0
EN203	55	0
UC101	55	0
EN201	56	0
HC204	56	0
HS161	56	0
AC103	57	0
EN202	57	0
HS145	58	0
GR421	58	0
AC102	58	0
HS222	59	0
HS218	59	0
HS210	59	0
EN207	59	0
HS141	60	0
CA102	60	0
HS112	60	0
HS163	60	0
CA103	60	0
HS131	60	0
CC331	60	85
HC201	60	0
GR430	60	0
CC101	60	0
HS138	60	0
HS120	60	0
HS140	60	0
HS108	60	0
HS162	60	0
CC326	60	101
GR431	60	0
HS122	60	0
HS130	60	0
CC325	61	94
HS219	61	0
HS173	61	0
HS202	62	0
HS166	62	0
HS111	62	0
HS224	63	0
CC324	63	102
HS109	64	0
HS213	64	0
CC320	64	104
GR407	65	0
DG126	65	0
GR406	65	0
HS178	65	0
CC201	66	0
CC319	66	102
CC301	66	130
CC318	67	103
GR422	67	0
HS107	67	0
CC317	67	116

HS143	67	0
HS142	67	0
HS187	68	0
HS167	68	0
CC308	68	115
HS230	68	0
HS174	68	0
HS195	68	0
CC315	69	113
HS110	69	0
HS216	70	0
CC316	70	126
HS118	70	0
HS179	70	0
HS134	70	0
CC314	71	117
HS133	71	0
HS146	72	0
HS154	73	0
HS144	73	0
HS115	74	0
CC339	74	75
GR413	75	0
CC340	75	71
HS194	75	0
CC342	75	80
CC311	75	125
HS114	75	0
HS231	75	0
GR438	75	0
HS228	75	0
HS106	75	0
HS192	75	0
GR425	75	0
HS116	75	0
CC321	76	126
CC337	76	67
HS139	77	0
HS182	77	0
CC309	78	131
HS200	78	0
HS193	79	0
GR420	80	0
GR405	80	0
HS126	80	0
HS123	80	0
CA105	80	0
HS197	80	0
CC338	80	73
CC307	81	128
HS201	82	0
HS220	82	0
CC310	82	127
HS188	83	0
HS221	83	0
HS157	83	0

CC304	84	136
HS184	84	0
CC341	84	70
HS159	85	0
HS176	85	0
AC302	85	0
HS198	85	0
CC302	87	136
HS119	87	0
CC303	87	125
HS217	87	0
HS180	90	0
HS181	90	0
CC327	90	138
CC306	95	147
CC305	96	153
CC334	96	174
HS229	97	0
CC335	98	155
HS185	100	0
HS150	101	0
HS177	104	0
HS164	105	0
HS113	105	0
HS223	108	0
HS124	112	0
HS152	113	0
HS233	116	0
CC336	121	193
AC301	130	0
HS206	135	0
HS148	135	0
CA601	135	0
HS196	137	0

TABLE C-5. BULK DENSITY VS ATTRITION

CODE	BULK DENSITY	ATTRITION
EP101	23	0.00
DG206	24	0.00
DG112	24	0.00
DG211	24	0.00
CY102	24	0.00
CA301	25	0.00
CA303	25	0.00
CA302	25	0.00
DG123	25	0.00
DG209	25	0.00
DG113	25	0.00
CA104	25	0.00
NL102	26	0.00
GR434	26	0.00
NL101	26	0.00
DG110	26	0.00
GR433	26	0.00
CY101	27	0.00
DG204	27	0.00
CY103	27	16.00
CY105	27	0.00
DG208	28	0.00
HS171	30	0.00
HS137	30	0.00
HS135	30	0.00
HS151	30	0.00
HS165	30	0.00
DG127	31	0.00
NL104	31	0.00
HS136	31	0.00
NL103	31	0.00
NC101	32	0.00
NL113	32	0.00
CY201	32	14.00
HS105	32	0.00
DG201	32	0.00
CY701	33	0.00
CY702	33	0.00
NL106	33	0.00
CY104	33	12.00
NL105	33	0.00
HS104	33	0.00
DG124	33	0.00
CY501	34	0.00
MN101	34	-0.00
MN102	34	-0.00
DP101	34	0.00
GR202	34	0.00
HS132	34	0.00

CY302	35	0.00
DP102	35	0.00
CY401	35	0.00
NL109	35	92.00
CY601	36	0.00
UC302	37	0.00
DG125	37	0.00
HS203	37	0.00
HS205	37	0.00
HS158	38	0.00
HS189	38	0.00
DG212	39	0.00
NL107	39	92.00
HC209	39	0.00
DG213	39	0.00
CC328	40	16.00
HS199	40	0.00
CA304	40	0.00
UC307	40	0.00
UC306	40	0.00
UC304	40	0.00
UC303	40	0.00
UC305	40	0.00
DG202	41	0.00
HS153	41	0.00
HS156	41	0.00
UC202	42	0.00
DG210	42	0.00
HS103	42	0.00
DG304	43	0.00
DG203	43	0.00
CC330	44	9.00
HS101	44	0.00
UC402	44	0.00
DG303	44	0.00
DG302	44	0.00
UC301	44	0.00
DG111	44	0.00
NL108	45	91.00
NL110	45	91.00
HS186	45	0.00
DG102	45	0.00
DG107	45	0.00
HS232	45	0.00
DG108	45	0.00
DG103	45	0.00
UC201	45	0.00
UC102	45	0.00
DG109	46	0.00
UC204	46	0.00
DG117	46	0.00
DG105	46	0.00
DG104	46	0.00
DG114	46	0.00
DG106	46	0.00
DG301	46	0.00

DG116	46	0.00
DG115	46	0.00
DG101	46	0.00
UC501	46	0.00
UC203	47	0.00
DG121	47	0.00
GR440	47	0.00
HS102	47	0.00
KC101	47	.20
HC205	47	0.00
DG120	47	0.00
DG119	48	0.00
DG122	48	0.00
CA305	48	0.00
CC329	48	5.00
CC322	48	5.00
DG118	48	0.00
CA201	49	0.00
HS212	49	0.00
CC312	49	8.00
DG305	49	0.00
EN101	49	.02
HC203	49	0.00
NL111	50	91.00
DG205	50	0.00
HS211	50	0.00
RM101	50	0.00
HS117	51	0.00
HS190	51	0.00
CC313	51	5.00
GR401	52	0.00
HS234	52	0.00
CC323	52	5.00
HS191	52	0.00
CC333	52	9.00
HS160	53	0.00
AC104	53	0.00
HS204	53	0.00
HC202	53	0.00
HC208	53	0.00
HS175	53	0.00
HS128	54	0.00
EN208	54	0.00
HS149	54	0.00
HS121	54	0.00
CC332	54	2.00
AC101	55	0.00
HS214	55	0.00
HS129	55	0.00
EN206	55	0.00
HS127	55	0.00
EN204	55	0.00
GR101	55	0.00
HS147	55	0.00
EN205	55	0.00
HS215	55	0.00

AC303	55	0.00
EN203	55	0.00
UC101	55	0.00
EN201	56	0.00
HC204	56	0.00
HS161	56	0.00
AC103	57	0.00
EN202	57	0.00
HS145	58	0.00
GR421	58	0.00
AC102	58	0.00
HS222	59	0.00
HS218	59	0.00
HS210	59	0.00
EN207	59	0.00
HS141	60	0.00
CA102	60	0.00
HS112	60	0.00
HS163	60	0.00
CA103	60	0.00
HS131	60	0.00
CC331	60	5.00
HC201	60	0.00
GR430	60	0.00
CC101	60	0.00
HS138	60	0.00
HS120	60	0.00
HS140	60	0.00
HS108	60	0.00
HS162	60	0.00
CC326	60	.70
GR431	60	0.00
HS122	60	0.00
HS130	60	0.00
CC325	61	3.00
HS219	61	0.00
HS173	61	0.00
HS202	62	0.00
HS166	62	0.00
HS111	62	0.00
HS224	63	0.00
CC324	63	.10
HS109	64	0.00
HS213	64	0.00
CC320	64	.80
GR407	65	0.00
DG126	65	0.00
GR406	65	0.00
HS178	65	0.00
CC201	66	0.00
CC319	66	3.00
CC301	66	8.00
CC318	67	5.00
GR422	67	0.00
HS107	67	0.00
CC317	67	3.00

HS143	67	0.00
HS142	67	0.00
HS187	68	0.00
HS167	68	0.00
CC308	68	3.00
HS230	68	0.00
HS174	68	0.00
HS195	68	0.00
CC315	69	1.20
HS110	69	0.00
HS216	70	0.00
CC316	70	1.00
HS118	70	0.00
HS179	70	0.00
HS134	70	0.00
CC314	71	3.00
HS133	71	0.00
HS146	72	0.00
HS154	73	0.00
HS144	73	0.00
HS115	74	0.00
CC339	74	0.00
GR413	75	0.00
CC340	75	0.00
HS194	75	0.00
CC342	75	0.00
CC311	75	.60
HS114	75	0.00
HS231	75	0.00
GR438	75	0.00
HS228	75	0.00
HS106	75	0.00
HS192	75	0.00
GR425	75	0.00
HS116	75	0.00
CC321	76	2.00
CC337	76	0.00
HS139	77	0.00
HS182	77	0.00
CC309	78	3.00
HS200	78	0.00
HS193	79	0.00
GR420	80	0.00
GR405	80	0.00
HS126	80	0.00
HS123	80	0.00
CA105	80	0.00
HS197	80	0.00
CC338	80	0.00
CC307	81	3.00
HS201	82	0.00
HS220	82	0.00
CC310	82	.80
HS188	83	0.00
HS221	83	0.00
HS157	83	0.00

CC304	84	2.00
HS184	84	0.00
CC341	84	0.00
HS159	85	0.00
HS176	85	0.00
AC302	85	0.00
HS198	85	0.00
CC302	87	2.00
HS119	87	0.00
CC303	87	7.00
HS217	87	0.00
HS180	90	0.00
HS181	90	0.00
CC327	90	3.00
CC306	95	7.00
CC305	96	.50
CC334	96	13.00
HS229	97	0.00
CC335	98	.20
HS185	100	0.00
HS150	101	0.00
HS177	104	0.00
HS164	105	0.00
HS113	105	0.00
HS223	108	0.00
HS124	112	0.00
HS152	113	0.00
HS233	116	0.00
CC336	121	3.00
AC301	130	0.00
HS206	135	0.00
HS148	135	0.00
CA601	135	0.00
HS196	137	0.00

TABLE C-6. ATTRITION VS HARDNESS

CODE	ATTRITION	HARDNESS
EN101	.02	95
CC324	.10	0
KC101	.20	0
CC335	.20	0
CC305	.50	0
CC311	.60	0
CC326	.70	0
CC320	.80	0
CC310	.80	0
CC316	1.00	0
MN103	1.00	0
CC315	1.20	0
CC321	2.00	0
CC304	2.00	0
CC302	2.00	0
CC332	2.00	0
CC325	3.00	0
CC307	3.00	0
CC308	3.00	0
CC336	3.00	0
CC319	3.00	0
CC309	3.00	0
CC317	3.00	0
CC327	3.00	0
CC314	3.00	0
CC331	5.00	0
CC323	5.00	0
CC313	5.00	0
CC322	5.00	0
CC329	5.00	0
CC318	5.00	0
CC303	7.00	0
CC306	7.00	0
CC301	8.00	0
CC312	8.00	0
CC330	9.00	0
CC333	9.00	0
CY104	12.00	0
CC334	13.00	0
CY201	14.00	0
CC328	16.00	0
CY103	16.00	0
NL108	91.00	0
NL111	91.00	0
NL110	91.00	0
NL107	92.00	0
NL109	92.00	0

APPENDIX D

A COMPUTER LOGIC FOR CATALOGING, SORTING, AND TABULATION

APPENDIX D

A COMPUTER LOGIC FOR CATALOGING, SORTING, AND TABULATION

A general-purpose data storage and retrieval program has been written in Fortran IV language, specifically for Battelle's CDC 6400 computer system, and capable of indefinite expansion up to the limits of any available computer compatible with a Fortran IV system.

Input

Information is punched into cards, one element per card. One element of information consists of both numeric and alphanumeric parts. Each element of information bears both a material code and a property code which uniquely identify the element. Twenty properties are permitted for each material, as given in Table 1. The computer stores the element of information in the information array according to material and property codes. Whenever an updated or corrected element of information is entered the program indicates the update by printing the old information which is being replaced. This permits some control over accidental and unintentional misidentification of new information.

Preparation of the input information is the time-limiting operation and the operation during which a number of technical judgments are made. Once information has been abstracted from printed material for a set of chosen substances, the keypunching of computer cards proceeds quite rapidly. The Computer manipulation of this input data is comparitively rapid. Any judgments based on scanning the computer output may require some time and thought, but it appears that the time-limiting operation is the preparation of the input data, during which time the required technical judgments must be made by knowledgable personnel.

A system of this type would seem to be best suited to situations in which technical judgments can be set up and clearly specified in advance. Hence the logical or judgmental structure must necessarily be rigid. This entire system is flexible only to the extent that various comparisons can be made within this fixed judgmental structure. Personnel must be trained to set up the data input with sufficient internal checks and balances to insure that typographical errors and mistakes are minimized. This requires that simple and standard procedures be set up, and also suggests that flexibility is not one of the hallmarks of such a system.

After all the input data have been read into the computer, the user may arrange, manipulate, print, save, or calculate changes in numerica data, all by the judicious use of the available program options. These options are controlled by the user, and are called into operation by reading into the computer the appropriate option command cards. These commands are performed one at a time in the order that they appear in the command deck. These manipulation operations are described briefly here. The program listing that follows this discussion indicates the required card forms and usage rules that are required.

Sorting

Since the information elements are stored in the data matrix in the order that initial elements were encountered in the data deck, it was necessary to provide some means for ordering the stored information. Three sorting options have been provided.

SORTN XX causes the rearrangement of the entire data store in order of increasing numeric value of property code XX.

SORTA XX causes the rearrangement of the entire data matrix in increasing alphanumeric value of the alphanumeric field associated with property code XX.

Numerical Calculations

The program provides four means of modifying numerical information by calculation. Inversion (INVRT XX) calls for the reciprocal of the numeric value of the property code XX. This will be done to all the values for all materials. Inversion of zero produces a minus zero. The original numeric values are not saved.

Numeric values may be multiplied by a constant (FACTR XX) which is specified on the command card. All the available (non-zero) values of property XX are so treated. The original values are not saved.

Arithemetic operations are available through the command ALTER XX P YY. This command causes the numeric values in XX to be treated by the numeric values in YY according to the value of the operator P: Multiplication (*), Division (/), Subtraction (-), or Addition (+). Division by a zero in YY produces a minus zero in XX. Again, the original value of XX is not saved.

A constant specified on the command card may be added to all numeric values of XX by calling ADDTO XX.

Output and Tape Storage

Six types of output are provided by the program.

BLITZ dumps the data store using a fixed format. All the information for every material is printed, two materials per page.

TABLE produces printed output similar to the master tables of Appendix A, and from which these A tables were produced. This fixed-format output has been included to permit more efficient handling of important alphanumeric information such as name and classification, composition, major uses, comments, etc.

PRINT XX prints the material code, the numeric values, and the alphanumeric comments of property code XX for each substance in the data store. No entry is printed where the numeric value is zero (or blank), provided the alphanumeric value is also blank. The output format is specified by the user (see Require Specifications below).

PRINT XX N YY prints material code, followed by the numeric values of property codes XX and YY. If the value of XX is zero (or blank), no entry will be printed.

PRINT XX A YY prints the material code and the alphanumeric values of property codes XX and YY.

PRINT XX B YY prints the material code, the alphanumeric value of property code XX, and the numeric value of property code YY.

The program user may wish to preserve the information store on tape rather than on punched cards. The option WRITE causes the program to copy the data matrix onto a specified tape (Tape 7 on the CDC 6400). This taped information is returned to the core storage upon subsequent use of the program by calling COPY 7.

Required Specifications

The user must specify the output formats for the four PRINT commands described above. If labels for the various output tables are desired, they must also be specified by the user.

FORMT causes the storage of a variable format specified by the user. When a format is stored, it remains in effect until replaced by a new format supplied by a new FORMT command.

LABEL immediately prints any variable format which is to be used for Table or column headings. Although this command as required by the program looks like a format (FORMT) command, it is executed immediately, and is not stored by the program for subsequent use. Whenever a label is desired, it must be entered at the appropriate place in the command deck.

Summary and Program Listing

The program listing which follows shows that this program is unsophisticated even though the possible combinations of user options are many. Enough options have been provided to permit the generation of a large number of two-column and larger tables, which can be produced at the command of the user and in a format compatible with the user's needs. Prior to output, the data store may be modified and sorted in a total of seven ways. More sophisticated sorting and perhaps even search procedures are not required at the present time, although these are programmable if needed at a future time.

A complete listing of the program from which these tables have been produced is included below, including the command deck listing.

Table D-1. Listing of Command Deck Used to Produce Tables.

```
NDATA
COPY7               RESTORE DATA MATRIX
NDATA
BLITZ
TABLE
FORMT               (1H ,19X,A5,2X,3A10)
LABEL               (1H1,19X,27HTABLE B-3.  AVAILABLE SIZES//)
LABEL               (20X,4HCODE,5X,4HSIZE//)
PRINT  A04
LABEL               (1H1,19X,28HTABLE B-4.  AVAILABLE SHAPES//)
LABEL               (20X,4HCODE,5X,5HSHAPE//)
PRINT  A05
SORTA   01
TABLE
SORTA   02
TABLE
SORTA   12
LABEL               (1H1,19X,26HTABLE B-11.  CRYSTALLINITY//)
LABEL               (20X,4HCODE, 3X,13HCRYSTALLINITY//)
PRINT  A12
FORMT               (1H ,19X,A5,2X,F10.2,2X,3A10)
SORTN   10
LABEL               (1H1,19X,44HTABLE B-9. SURFACE AREA(SQ. METERS PER GRAM)//)
LABEL               (20X,4HCODE,8X,4HAREA,3X,8HCOMMENTS//)
PRINT   10
FORMT               (1H ,19X,A5,2X,F10.2,2X,F10.0)
LABEL               (1H1,19X,38HTABLE C-2.  SURFACE AREA VS. PORE SIZE//)
LABEL               (20X,4HCODE,8X,4HAREA,9X,4HSIZE//)
PRINT10N08
FORMT               (1H ,19X,A5,2X,F10.2,2X,F10.0)
LABEL               (1H1,19X,42HTABLE C-3.  SURFACE AREA VS. MAXIMUM TEMP.//)
LABEL               (20X,4HCODE,9X,4HAREA,6X,11HTEMPERATURE//)
PRINT10N18
FORMT               (1H ,19X,A5,2X,F10.0,2X,3A10)
SORTN   18
LABEL               (1H1,19X,43HTABLE B-15. MAXIMUM SERVICE TEMPERATURE (F)//)
LABEL               (20X,4HCODE,8X,5HTEMP.,7X,8HCOMMENTS//)
PRINT   18
SORTN   17
LABEL               (1H1,19X,45HTABLE B-14. PARTICLE DENSITY(LB. PER CU. FT.)//)
LABEL               (20X,4HCODE,6X,7HDENSITY,2X,8HCOMMENTS//)
PRINT   17
SORTN   13
LABEL               (1H1,19X,41HTABLE B-12.  CRYSTALLITE SIZE (ANGSTROMS)//)
LABEL               (20X,4HCODE,9X,4HSIZE,2X,8HCOMMENTS//)
PRINT   13
SORTN   06
LABEL               (1H1,19X,37HTABLE B-5.  CRUSHING STRENGTH IN LBS.//)
LABEL               (29X,8HCRUSHING/20X,4HCODE,5X,8HSTRENGTH,2X,8HCOMMENTS//)
PRINT   06
SORTN   07
LABEL               (1H1,19X,20HTABLE B-6.  HARDNESS//)
LABEL               (20X,4HCODE,5X,8HHARDNESS,5X,8HCOMMENTS//)
PRINT   07
SORTN   11
LABEL               (1H1,19X,41HTABLE B-10. BULK DENSITY(LBS. PER CU. FT)//)
```

Table D-1. (Continued)

```
LABEL          (20X,4HCODE,6X,7HDENSITY,2X,8HCOMMENTS//)
PRINT   11
FORMT          (1H ,19X,A5,2X,F10.0,2X,F10.0)
LABEL          (1H1,19X,45HTABLE C-4.  BULK DENSITY VS. PARTICLE DENSITY//)
LABEL          (30X,4HBULK,7X,8HPARTICLE )
LABEL          (20X,4HCODE,6X,7HDENSITY ,4X,7HDENSITY //)
PRINT11N17
FORMT          (1H ,19X,A5,2X,F10.0,2X,F10.2)
LABEL          (1H1,19X,37HTABLE C-5.  BULK DENSITY VS ATTRITION//)
LABEL          (30X,4HBULK /20X,4HCODE,6X,7HDENSITY,3X,9HATTRITION //)
PRINT11N19
FORMT          (1H ,19X,A5,2X,F10.2,2X,F10.1)
SORTN   19
LABEL          (1H1,19X,33HTABLE C-6.  ATTRITION VS HARDNESS//)
LABEL          (20X,4HCODE,4X,9HATTRITION,4X,8HHARDNESS//)
PRINT19N 7
FORMT          (1H ,19X,A5,2X,F10.2,2X,3A10)
LABEL          (1H1,19X,33HTABLE B-16.  ATTRITION (PER CENT)//)
LABEL          (20X,4HCODE,4X,9HATTRITION,3X,8HCOMMENTS//)
PRINT   19
FORMT          (1H ,19X,A5,2X,F10.1,2X,3A10)
SORTN   16
LABEL          (1H1,19X,37HTABLE B-13.  IGNITION LOSS (PER CENT)//)
LABEL          (20X,4HCODE,9X,4HLOSS,3X,8HCOMMENTS//)
PRINT   16
FORMT          (1H ,19X,A5,2X,F10.0,2X,3A10)
SORTN   08
LABEL          (1H1,19X,34HTABLE B-7.  PORE SIZE IN ANGSTROMS//)
LABEL          (33X,4HPORE /20X,4HCODE,9X,4HSIZE,2X,8HCOMMENTS //)
PRINT   08
FORMT          (1H ,19X,A5,2X,F10.3,2X,3A10)
SORTN   09
LABEL          (1H1,19X,31HTABLE B-8.  PORE VOLUME (CC/GM)//)
LABEL          (33X,4HPORE /20X,4HCODE,7X,6HVOLUME,2X,8HCOMMENTS //)
PRINT   09
FORMT          (1H ,19X,A5,2X,F10.3,2X,F10.0)
LABEL          (1H1,19X,37HTABLE C-1.  PORE VOLUME VS. PORE SIZE//)
LABEL          (33X,4HPORE,8X,4HPORE/20X,4HCODE,7X,6HVOLUME,8X,4HSIZE//)
PRINT09N08
FORMT          (1H ,19X,A5,2X,F10.0,2X,3A10)
SORTN   03
LABEL          (1H1,19X,*TABLE B-1.  COST ($/TON) AND SECONDARY COMPOS.*//)
LABEL          (20X,4HCODE,9X,4HCOST,2X,21HSECONDARY COMPOSITION //)
PRINT   03
FORMT          (1H ,19X,A5,2X,3A10)
SORTA   03
LABEL          (1H1,19X,*TABLE B-2.  SECONDARY COMPOSITION*//)
LABEL          (20X,4HCODE,3X,21HSECONDARY COMPOSITION //)
PRINT  A03
```

Table D-1. (Continued)

```
LABEL           (20X,4HCODE,6X,7HDENSITY,2X,8HCOMMENTS//)
PRINT    11
FORMT           (1H ,19X,A5,2X,F10.0,2X,F10.0)
LABEL           (1H1,19X,45HTABLE C-4.  BULK DENSITY VS. PARTICLE DENSITY//)
LABEL           (30X,4HBULK,7X,8HPARTICLE )
LABEL           (20X,4HCODE,6X,7HDENSITY ,4X,7HDENSITY //)
PRINT11N17
FORMT           (1H ,19X,A5,2X,F10.0,2X,F10.2)
LABEL           (1H1,19X,37HTABLE C-5.  BULK DENSITY VS ATTRITION//)
LABEL           (30X,4HBULK /20X,4HCODE,6X,7HDENSITY,3X,9HATTRITION //)
PRINT11N19
FORMT           (1H ,19X,A5,2X,F10.2,2X,F10.)
SORTN    19
LABEL           (1H1,19X,33HTABLE C-6.  ATTRITION VS HARDNESS//)
LABEL           (20X,4HCODE,4X,9HATTRITION,4X,8HHARDNESS//)
PRINT19N 7
FORMT           (1H ,19X,A5,2X,F10.2,2X,3A10)
LABEL           (1H1,19X,33HTABLE B-16.  ATTRITION (PER CENT)//)
LABEL           (20X,4HCODE,4X,9HATTRITION,3X,8HCOMMENTS//)
PRINT    19
FORMT           (1H ,19X,A5,2X,F10.1,2X,3A10)
SORTN    16
LABEL           (1H1,19X,37HTABLE B-13.  IGNITION LOSS (PER CENT)//)
LABEL           (20X,4HCODE,9X,4HLOSS,3X,8HCOMMENTS//)
PRINT    16
FORMT           (1H ,19X,A5,2X,F10.0,2X,3A10)
SORTN    08
LABEL           (1H1,19X,34HTABLE B-7.  PORE SIZE IN ANGSTROMS//)
LABEL           (33X,4HPORE /20X,4HCODE,9X,4HSIZE,2X,8HCOMMENTS //)
PRINT    08
FORMT           (1H ,19X,A5,2X,F10.3,2X,3A10)
SORTN    09
LABEL           (1H1,19X,31HTABLE B-8.  PORE VOLUME (CC/GM)//)
LABEL           (33X,4HPORE /20X,4HCODE,7X,6HVOLUME,2X,8HCOMMENTS //)
PRINT    09
FORMT           (1H ,19X,A5,2X,F10.3,2X,F10.0)
LABEL           (1H1,19X,37HTABLE C-1.  PORE VOLUME VS. PORE SIZE//)
LABEL           (33X,4HPORE,8X,4HPORE/20X,4HCODE,7X,6HVOLUME,8X,4HSIZE//)
PRINT09N08
FORMT           (1H ,19X,A5,2X,F10.0,2X,3A10)
SORTN    03
LABEL           (1H1,19X,*TABLE B-1.  COST ($/TON) AND SECONDARY COMPOS.*//)
LABEL           (20X,4HCODE,9X,4HCOST,2X,21HSECONDARY COMPOSITION //)
PRINT    03
FORMT           (1H ,19X,A5,2X,3A10)
SORTA    03
LABEL           (1H1,19X,*TABLE B-2.  SECONDARY COMPOSITION*//)
LABEL           (20X,4HCODE,3X,21HSECONDARY COMPOSITION //)
PRINT   A03
```

Table D-1. Listing of Command Deck Used to Produce Tables.

```
NDATA
COPY7                     RESTORE DATA MATRIX
NDATA
BLITZ
TABLE
FORMT                     (1H ,19X,A5,2X,3A10)
LABEL                     (1H1,19X,27HTABLE B-3.  AVAILABLE SIZES//)
LABEL                     (20X,4HCODE,5X,4HSIZE//)
PRINT  A04
LABEL                     (1H1,19X,28HTABLE B-4.  AVAILABLE SHAPES//)
LABEL                     (20X,4HCODE,5X,5HSHAPE//)
PRINT  A05
SORTA   01
TABLE
SORTA   02
TABLE
SORTA   12
LABEL                     (1H1,19X,26HTABLE B-11.  CRYSTALLINITY//)
LABEL                     (20X,4HCODE, 3X,13HCRYSTALLINITY//)
PRINT  A12
FORMT                     (1H ,19X,A5,2X,F10.2,2X,3A10)
SORTN   10
LABEL                     (1H1,19X,44HTABLE B-9. SURFACE AREA(SQ. METERS PER GRAM)//)
LABEL                     (20X,4HCODE,8X,4HAREA,3X,8HCOMMENTS//)
PRINT   10
FORMT                     (1H ,19X,A5,2X,F10.2,2X,F10.0)
LABEL                     (1H1,19X,38HTABLE C-2.  SURFACE AREA VS. PORE SIZE//)
LABEL                     (20X,4HCODE,8X,4HAREA,9X,4HSIZE//)
PRINT10N08
FORMT                     (1H ,19X,A5,2X,F10.2,2X,F10.0)
LABEL                     (1H1,19X,42HTABLE C-3.  SURFACE AREA VS. MAXIMUM TEMP.//)
LABEL                     (20X,4HCODE,9X,4HAREA,6X,11HTEMPERATURE//)
PRINT10N18
FORMT                     (1H ,19X,A5,2X,F10.0,2X,3A10)
SORTN   18
LABEL                     (1H1,19X,43HTABLE B-15. MAXIMUM SERVICE TEMPERATURE (F)//)
LABEL                     (20X,4HCODE,8X,5HTEMP.,7X,8HCOMMENTS//)
PRINT   18
SORTN   17
LABEL                     (1H1,19X,45HTABLE B-14. PARTICLE DENSITY(LB. PER CU. FT.)//)
LABEL                     (20X,4HCODE,6X,7HDENSITY,2X,8HCOMMENTS//)
PRINT   17
SORTN   13
LABEL                     (1H1,19X,41HTABLE B-12.  CRYSTALLITE SIZE (ANGSTROMS)//)
LABEL                     (20X,4HCODE,9X,4HSIZE,2X,8HCOMMENTS//)
PRINT   13
SORTN   06
LABEL                     (1H1,19X,37HTABLE B-5.  CRUSHING STRENGTH IN LBS.//)
LABEL                     (29X,8HCRUSHING/20X,4HCODE,5X,8HSTRENGTH,2X,8HCOMMENTS//)
PRINT   06
SORTN   07
LABEL                     (1H1,19X,20HTABLE B-6.  HARDNESS//)
LABEL                     (20X,4HCODE,5X,8HHARDNESS,5X,8HCOMMENTS//)
PRINT   07
SORTN   11
LABEL                     (1H1,19X,41HTABLE B-10. BULK DENSITY(LBS. PER CU. FT)//)
```

```
              PROGRAM TABLES (INPUT,OUTPUT,TAPE5=INPUT,TAPE6=OUTPUT,TAPE7)
        C
0003          DIMENSION IA(3).IDATA(380,20,3),XDATA(380,20),KODE(380),IN(6),
             1          IFORM(6),TEMP(20),ITMP(20,3)
0003          DIMENSION LITO (2,20)
0003          DATA IFORM/6*10H          /
0003          DATA LITO / 10H       CLAS ,10HSIFICATION ,
             1            10H          C ,10HOMPOSITION ,
             2            10H    COST,   ,10H2CD ACTIVE ,
             3            10H      AVAIL ,10HABLE SIZES ,
             4            10H     AVAILA ,10HBLE SHAPES ,
             5            10H       CRUS ,10HH STRENGTH ,
             6            10H            ,10H  HARDNESS ,
             7            10H            ,10H PORE SIZE ,
             8            10H          P ,10HORE VOLUME ,
             9            10H         SU ,10HRFACE AREA ,
             1            10H         BU ,10HLK DENSITY ,
             1            10H        CRY ,10HSTALLINITY ,
             2            10H     CRYSTA ,10HLLITE SIZE ,
             3            10H            ,10HMAJOR USES ,
             4            10H            ,10HMAJOR USES ,
             5            10H            ,10HVOLATILITY ,
             6            10H     PARTIC ,10HLE DENSITY ,
             7            10H       MAX. ,10H OP. TEMP. ,
             8            10H            ,10H ATTRITION ,
             9            10H            ,10H  COMMENTS /
          C
          C     PROGRAM WRITTEN BY D. P. MOON, JANUARY 1969.
          C
          C     THIS IS INTENDED AS A GENERAL-PURPOSE DATA STORAGE AND RETRIEVAL
          C     PROGRAM, WITH LIMITED FACILITY FOR DATA REARRANGEMENT (SORTING)
          C     AND MANIPULATION.  DATA ARE STORED ON PUNCHED CARDS, ONE ELEMENT
          C     OF DATA PER CARD.  EACH CARD CONTAINS DATA IN THE FOLLOWING FORM
          C           CC   FORMAT   CONTENTS
          C          1- 5    A5   CODE DESIGNATING SUBSTANCE OR MATERIAL
          C          9-10    I2   CODE DESIGNATING PROPERTY OR CHARACTERISTIC
          C         11-20 E10.0   NUMERIC VALUE, IF ANY, OF PROPERTY
          C         21-50  3A10   ALPHANUMERIC VALUE OR REMARKS
          C     DIMENSIONS FOR NUMERIC VALUES SHOULD BE SET BY PROGRAM USER AND
          C     MAY BE RECORDED IN REMARKS.
          C
          C     AS EACH CARD IS READ IN, THE SUBSTANCE CODE IS EXAMINED TO SEE IF
          C     A NEW ONE, THEN AN ARRAY INDEX L IS ASSIGNED TO IT.  THE PROPERTY
          C     CODE IS USED AS ARRAY INDEX M.  THE VALUE OF THE PROPERTY IS THEN
          C     STORED IN LOCATION (L,M).  NOTE THAT THIS ALLOWS FOR ONLY ONE
          C     VALUE FOR A PROPERTY.  IF DUPLICATES ARE ENCOUNTERED, THE LATEST
          C     VALUE WILL BE RETAINED AND OTHERS PRINTED OUT TO ALERT USER.
          C
          C     DIMENSIONAL LIMITS FOR THE ABOVE ARE
          C        L  380 SUBSTANCES OR MATERIALS
          C        M   20 CHARACTERISTICS      .
          C
          C     NDATA SIGNIFIES THE END OF INPUT DATA.  FOLLOWING NDATA, THE USER
          C     MAY REARRANGE, MANIPULATE, PRINT OUT, OR PUNCH DATA BY JUDICIOUS
```

```
C     USE OF THE FOLLOWING OPTION CARDS, IN ANY COMBINATION OR SEQUENCE.
C     OPERATIONS WILL BE PERFORMED IN THE ORDER CALLED FOR.   LATER
C     CORRECTION OF DATA MAY BE HANDLED BY MEANS OF WRITE AND COPY7
C     OPTIONS
C
C          **CC 1-10*     OPERATION
C          BLITZ         *PRODUCES SERIAL DUMP OF DATA ARRAY, USING
C                         FIXED FORMAT
C          TABLE         *PRINTS PREDEFINED TABLE
C          FORMT         *STORES VARIABLE FORMAT IN CC 21-80 FOR LATER
C                         USE IN DATA OUTPUT.  SEE CDC 6400 REF. MANUAL.
C                         FORMT MAY BE CHANGED BY SUBSEQUENT FORMT CARD.
C          LABEL         *PRINTS VARIABLE FORMAT IN CC 21-80.  USED FOR
C                         PAGE OR COLUMN HEADINGS.  NOT STORED.
C          PRINT   XX    *PRINTS SUBSTANCE CODE, NUMERIC VALUE, AND
C                         ALPHANUMERIC VALUE OF CHARACTERISTIC XX FOR
C                         EACH SUBSTANCE PER FORMT.  OMITS ENTRIES WHERE
C                         VALUES ARE BLANK.  XX MUST BE INTEGER 1-20.
C                        *IN NEXT TWO OPTIONS, SET YY EQUAL TO ZERO OR
C                         BLANK IF ONLY XX IS DESIRED.
C          PRINTXXNYY    *PRINTS SUBSTANCE CODE AND NUMERIC VALUES ONLY.
C          PRINTXXAYY    *PRINTS SUBSTANCE CODE AND ALPHANUMERIC VALUES
C                         ONLY.
C          PRINTXXBYY    *PRINTS SUBSTANCE CODE, ALPHANUMERIC VALUE OF
C                         XX, THEN NUMERIC VALUE OF YY, ONLY.  FOR
C                         EXAMPLE, XX MAY BE NAME OF SUBSTANCE, YY A
C                         PROPERTY.
C          INVRT   XX    *INVERTS THE NUMERICAL VALUE OF CHARACTERISTIC
C                         XX.  1/0 = MINUS ZERO.
C          FACTR   XX    *MULTIPLIES EACH NUMERIC VALUE OF CHARACTERISTIC
C                         XX BY FLOATING POINT FACTOR IN CC 11-20.
C          ALTERXXPYY    *PERFORMS OPERATION XX (OP) YY USING NUMERIC
C                         VALUES OF CHARACTERISTICS XX AND YY AND STORES
C                         RESULT AS NEW NUMERIC VALUE OF XX.  OPERATOR
C                         P MAY BE + - * OR /.  DIVISION BY ZERO PRODUCES
C                         A MINUS ZERO.  FORMER VALUE OF XX IS DESTROYED.
C          ADDTO   XX    *ADDS THE QUANTITY SPECIFIED IN CC 11-20 TO
C                  .      THE NUMERICAL VALUE OF CHARACTERISTIC XX.
C     ****IN ORDER TO AVOID THE CREATION OF FALSE DATA, INVRT, FACTR,
C     ****ADDTO AND ALTER ARE PROGRAMMED TO REGARD AN ABSOLUTE VALUE
C     ****LESS THAN 10**-10 AS A BLANK ENTRY AND TO RETURN A MINUS
C     ****ZERO.
C          SORTN   XX    *REARRANGES SUBSTANCES AND ALL DATA IN ORDER OF
C                         INCREASING NUMERIC VALUES OF CHARACTERISTIC XX.
C          SORTA   XX    *ALPHABETIC SORT, N O T  ALPHNUMERIC
C          SORTK         *DITTO FOR MATERIAL CODES
C          WRITE         *WRITES DATA FROM STORAGE ARRAYS ONTO TAPE 7.
C                         IF TO BE SAVED, TAPE REQUEST CARD MUST BE USED
C                         TO ASSIGN MAGNETIC.  OTHERWISE, DISC MAY BE
C                         USED FOR TEMPORARY STORAGE.
C          COPY7         *COPIES DATA FROM TAPE 7 AND STORES IT IN
C                         ORIGINAL ARRAYS.  RETURNS USER TO DATA ENTRY
C                         PORTION OF PROGRAM, THUS REQUIRES AN NDATA
C                         CARD BEFORE OTHER OPTIONS CAN BE PERFORMED.
C          MORE          *RETURNS USER TO START OF PROGRAM AFTER AN
```

```
                               NDATA AND ALLOWS READING IN OF MORE DATA
       C
       C
       C     A 7-8-9 END OF FILE INDICATES END OF OPTION DECK.  MUST BE PRESENT
       C     AND MUST BE FOLLOWED BY 6-7-8-9 END OF JOB CARD.
       C
0003         REWIND 7
0005         DO 98 I=1,22800
0007      98 IDATA(I)=10H
0013         DO 99 I=1,7600
0014      99 XDATA(I)=0.
0020         NL=0
       C     READ DATA INPUT
0021      10 READ (5,1) ITEM,I,K,M,X,IN
0041         IF(EOF,5) 11,12
0044      11 CALL EXIT
0045      12 IF(ITEM.EQ.5HNDATA) GO TO 50
0047         IF(NL.LT.1) GO TO 30
0052       1 FORMAT(A5,I2,A1,I2,F10.0,6A10)
       C     TEST FOR PREVIOUS STORAGE OF ITEM. IF SO, GO TO 31.
0052         DO 20 L=1,NL
0053         IF(ITEM.EQ.KODE(L)) GO TO 31
0055      20 CONTINUE
       C     ITEM NOT PREVIOUSLY STORED. BUMP NL BY 1.
0057      30 NL=NL+1
0061         IF(NL.GT.380) GO TO 33
0064         L=NL
0064      31 IF(M.GT.20) GO TO 35
       C     STORE DATA IN LOCATION (L,M).
0070         IF(XDATA(L,M).NE.0.) GO TO 40
0073         IF(IDATA(L,M,1).NE.10H          ) GO TO 40
0077      32 XDATA(L,M)=X
0103         KODE(L)=ITEM
0105         IDATA(L,M,1)=IN(1)
0110         IDATA(L,M,2)=IN(2)
0114         IDATA(L,M,3)=IN(3)
0117         GO TO 10
0117      33 NL=380
0120         PRINT 4
0124       4 FORMAT(1H0,31HNUMBER OF ENTRIES EXCEEDS LIMIT )
0124      34 PRINT 2, ITEM,M,X,IN(1),IN(2),IN(3)
0144         GO TO 10
0145      35 PRINT 5
0151       5 FORMAT(1H0,12HCODING ERROR)
0151         GO TO 34
       C     PRINT OUT DELETED ENTRY.
0152      40 PRINT 2, KODE(L),M,XDATA(L,M),IDATA(L,M,1),IDATA(L,M,2)
0175       2 FORMAT(1H0,15HDELETED ENTRY  ,A5,2X,I2,2X,E10.0,2X,3A10)
0175         GO TO 32
       C     ALL DATA HAVE BEEN READ IN AND STORED.
0176      50 READ(5,1) ITEM,I,K,M,X,IN
0216         IF(EOF,5) 51,52
0221      51 CALL EXIT
0222      52 IF(I.GT.20.OR.M.GT.20) GO TO 53
0232         IF(ITEM.EQ.5HFORMT) GO TO 60
0234         IF(ITEM.EQ.5HMORE ) GO TO 10
```

```
0235          IF(ITEM.EQ.5HLABEL) GO TO 70
0237          IF(ITEM.EQ.5HPRINT) GO TO 100
0240          IF(ITEM.EQ.5HSORTN) GO TO 201
0242          IF(ITEM.EQ.5HSORTA) GO TO 200
0243          IF(ITEM.EQ.5HSORTK) GO TO 202
0245          IF(ITEM.EQ.5HFACTR) GO TO 80
0246          IF(ITEM.EQ.5HINVRT) GO TO 90
0250          IF(ITEM.EQ.5HALTER) GO TO 400
0251          IF(ITEM.EQ.5HADDTO) GO TO 420
0253          IF(ITEM.EQ.5HWRITE) GO TO 500
0254          IF(ITEM.EQ.5HCOPY7) GO TO 600
0256          IF(ITEM.EQ.5HTABLE) GO TO 700
0257          IF(ITEM.EQ.5HBLITZ) GO TO 800
        C     ERROR IN OPTION CARD. STOP RUN.
0261       53 PRINT 3,   ITEM,I,K,M,X,IN
0301        3 FORMAT(1H0,15HOPTION ERROR   ,A5,I2,A1,I2,E10.0,6A10)
0301          CALL EXIT
        C     STORE FORMAT FOR LATER USE
0302       60 DO 61 I=1,6
0304       61 IFORM(I)=IN(I)
0307          GO TO 50
        C     PRINT HEADINGS AND LABELS
0310       70 WRITE(6,IN)
0314          GO TO 50
        C     MULTIPLY NUMERICAL VALUES OF CHARACTERISTIC M BY FACTOR X.
0315       80 DO 81 I=1,NL
0317       81 XDATA(I,M)=XDATA(I,M)*X
0326          GO TO 50
        C     INVERT NUMERICAL VALUES OF CHARACTERISTIC M.
0327       90 DO 92 I=1,NL
0331          IF(ABS(XDATA(I,M)).LT.1.E-05) GO TO 91
0337          XDATA(I,M)=1./XDATA(I,M)
0342          GO TO 92
0343       91 XDATA(I,M)=-0.
0347       92 CONTINUE
0352          GO TO 50
        C     PRINT OUTPUT PER IFORM
0352      100 IF(I.EQ.0.OR.M.EQ.0) GO TO 110
0360          IF(K.EQ.1HA) GO TO 140
0362          IF(K.EQ.1HN) GO TO 150
0363          IF(K.EQ.1HB) GO TO 160
0365          GO TO 53
0365      110 IF(I.EQ.0.AND.M.EQ.0) GO TO 53
0373          M=MAX0(I,M)
0376          IF(K.EQ.1HA) GO TO 120
0400          IF(K.EQ.1HN) GO TO 130
0401          DO 111 J=1,NL
0403          IF(ABS(XDATA(J,M)).GT.1.E-05)GO TO 211
0412          IF(IDATA(J,M,1).EQ.10H          )GO TO 111
0415      211 WRITE(6,IFORM) KODE(J),XDATA(J,M),IDATA(J,M,1),IDATA(J,M,2),
             1IDATA(J,M,3)
0441      111 CONTINUE
0444          GO TO 50
0444      120 DO 121 J=1,NL
0446          IF(IDATA(J,M,1).EQ.10H          ) GO TO 121
```

```
0452            WRITE(6,IFORM) KODE(J),IDATA(J,M,1),IDATA(J,M,2),IDATA(J,M,3)
0473        121 CONTINUE
0476            GO TO 50
0476        130 DO 131 J=1,NL
0500            IF(ABS(XDATA(J,M)).LT.1.E-05) GO TO 131
0506            WRITE(6,IFORM) KODE(J),XDATA(J,M)
0520        131 CONTINUE
0523            GO TO 50
0523        140 DO 141 J=1,NL
0525            IF(IDATA(J,I,1).EQ.10H          ) GO TO 141
0531            WRITE(6,IFORM) KODE(J),(IDATA(J,I,L),L=1,3),(IDATA(J,M,K),K=1,3)
0563        141 CONTINUE
0566            GO TO 50
0566        150 DO 151 J=1,NL
0570            IF(ABS(XDATA(J,I)).LT.1.E-05) GO TO 151
0576            WRITE(6,IFORM) KODE(J),XDATA(J,I),XDATA(J,M)
0614        151 CONTINUE
0617            GO TO 50
0617        160 DO 161 J=1,NL
0621            IF(ABS(XDATA(J,M)).LT.1.E-05) GO TO 161
0627            WRITE(6,IFORM) KODE(J),(IDATA(J,I,K),K=1,3),XDATA(J,M)
0653        161 CONTINUE
0656            GO TO 50
656         200 JJ=1
       C        ARRANGE DATA IN ALPHABETICAL ORDER OF CHARACTERISTIC M
657             GO TO 300
660         201 JJ=2
       C        ARRANGE ALL DATA IN ORDER OF INCREASING NUMERIC VALUES OF
       C        CHARACTERISTIC M.
661             GO TO 300
662         202 JJ=3
       C        SORT BY KODE
663         300 DO 360 I=1,NL
665             XTEM=XDATA(I,M)
671             IKOD=KODE(I)
672             DO 301 J=1,20
674             TEMP(J)=XDATA(I,J)
700             ITMP(J,1)=IDATA(I,J,1)
703             ITMP(J,3)=IDATA(I,J,3)
706         301 ITMP(J,2)=IDATA(I,J,2)
713             L=I+1
715             DO 350 J=L,NL
716             IF(L.GT.NL) GO TO 350
721             GO TO (302,303,1304),JJ
727         302 IF(IDATA(J,M,1).EQ.10H          ) GO TO 350
734             IF(IDATA(J,M,1).GT.ITMP(M,1)) GO TO 350
741             IF(IDATA(J,M,1).LT.ITMP(M,1)) GO TO 304
745             IF(IDATA(J,M,2).GT.ITMP(M,2)) GO TO 350
752             IF(IDATA(J,M,2).LT.ITMP(M,2)) GO TO 304
756             IF(IDATA(J,M,3).GE.ITMP(M,3)) GO TO 350
762             GO TO 304
762         303 IF(XDATA(J,M).GE.XTEM) GO TO 350
767             GO TO 304
770        1304 IF(KODE(J).GE.IKOD) GO TO 350
773         304 XTEM=XDATA(J,M)
```

```
777          IKOD=KODE(J)
001          KODE(J)=KODE(I)
003          KODE(I)=IKOD
004          DO 310 J1=1,20
006          TEMP(J1)=XDATA(J,J1)
012          XDATA(J,J1)=XDATA(I,J1)
017          XDATA(I,J1)=TEMP(J1)
022          DO 310 K=1,3
023          ITMP(J1,K)=IDATA(J,J1,K)
033          IDATA(J,J1,K)=IDATA(I,J1,K)
043      310 IDATA(I,J1,K)=ITMP(J1,K)
054      350 CONTINUE
057      360 CONTINUE
061          GO TO 50
       C     PERFORM OPERATION NUMERICAL VALUE OF XDATA(I) (OP. K) XDATA(M)
       C     AND STORE AS XDATA(I)
061      400 J=1
062          IF(K.EQ.1H+) GO TO 404
064          IF(K.EQ.1H-) GO TO 403
066          IF(K.EQ.1H*) GO TO 402
067          IF(K.EQ.1H/) GO TO 401
071          GO TO 53
071      401 J=J+1
073      402 J=J+1
075      403 J=J+1
077      404 DO 410 L=1,NL
101          IF(ABS(XDATA(L,I)).LT.1.E-05.OR.
           1  ABS(XDATA(L,M)).LT.1.E-05)  GO TO 409
121          GO TO (405,406,407,408),J
131      405 XDATA(L,I)=XDATA(L,I)+XDATA(L,M)
140          GO TO 410
140      406 XDATA(L,I)=XDATA(L,I)-XDATA(L,M)
147          GO TO 410
147      407 XDATA(L,I)=XDATA(L,I)*XDATA(L,M)
156          GO TO 410
156      408 XDATA(L,I)=XDATA(L,I)/XDATA(L,M)
165          GO TO 410
165      409 XDATA(L,I)=-0.
171      410 CONTINUE
174          GO TO 50
       C     ADD X TO NUMERICAL VALUES OF CHARACTERISTIC M.
174      420 DO 422 I=1,NL
176          IF(ABS(XDATA(I,M)).LT.1.E-05) GO TO 421
204          XDATA(I,M)=XDATA(I,M)+X
210          GO TO 422
210      421 XDATA(I,M)=-0.
214      422 CONTINUE
217          GO TO 50
       C     WRITE CONTENTS OF KODE, XDATA, AND IDATA ARRAYS ON TAPE 7.
217      500 WRITE(7)  NL,(KODE(I),I=1,NL),((XDATA(I,J),J=1,20),I=1,NL),
           1         (((IDATA(I,J,K),K=1,3),J=1,20),I=1,NL)
266          REWIND 7
270          GO TO 50
       C     COPY CONTENTS OF KODE, XDATA, AND IDATA ARRAYS FROM TAPE 7, THEN
       C     RETURN TO DATA INPUT PORTION OF PROGRAM.  NDATA CARD REQUIRED
       C      BEFORE OTHER OPTIONS CAN BE ACCEPTED.
1271      600 READ(7)    NL,(KODE(I),I=1,NL),((XDATA(I,J),J=1,20),I=1,NL),
            1         (((IDATA(I,J,K),K=1,3),J=1,20),I=1,NL)
1340          REWIND 7
1342          GO TO 10
       C      SERIAL DUMP OF DATA ARRAY
1343        6 FORMAT(6H1 CODE.5X,23HNAME AND CLASSIFICATION,16X,11HCOMPOSITION,
            1          18X,15HAVAILABLE SIZES,15X//)
1343        7 FORMAT(1X,A5,2X,3A10.2X,3A10,2X,3A10,2X,3A10)
1343        8 FORMAT(11H1MAX TEMP F,12X,10HMAJOR USES,22X,10HMAJOR USES,
            1      23X,8HCOMMENTS,16X,4HCODE//)
1343        9 FORMAT(1X,F10.0.2X,3A10,2X,3A10,2X,3A10.5X,A5)
1343      700 PRINT 6
1347          DO 710 J=1,NL
1351      710 PRINT 7, KODE(J),(IDATA(J,1,M),M=1,3),(IDATA(J,2,M),M=1,3),
            1                   (IDATA(J,4,M),M=1,3)
1411          PRINT 8
1414          DO 720 J=1,NL
1416      720 PRINT 9, XDATA(J,18),(IDATA(J,14,M),M=1,3),(IDATA(J,15,M),M=1,3),
            1                        (IDATA(J,20,M),M=1,3),KODE(J)
1460          GO TO 50
       C      SERIAL DUMP OF DATA ARRAY....BLITZ ROUTINE, 2 MATERIALS PER PAGE
460       800 DO 812 JP = 1,NL,2
462           WRITE (6,16)
465        16 FORMAT (1H1)
465           K = JP
467           DO 811 L = 1,2
470           J = K + L - 1
472           IF (J .GT. NL) GO TO 811
476           WRITE (6,116) KODE(J),KODE(J)
505       116 FORMAT (/// * MATERIAL CODE *, A5, 31X, *MATERIAL CODE *, A5//)
505           DO 810 M = 1,20
507       810 WRITE (6,17) LITO(1,M),LITO(2,M),M, XDATA(J,M),
            1  IDATA(J,M,1), IDATA(J,M,2), IDATA(J,M,3)
543        17 FORMAT (1X, 2A10, 1X, I2, 1X, F11.3, 1X, 3A10)
543       811 CONTINUE
545       812 CONTINUE
550           GO TO 50
550           END
```

APPENDIX E

THESAURUS OF CODES IDENTIFYING THE MATERIALS MANUFACTURERS

APPENDIX E
THESAURUS OF MATERIALS CODES

CODE	IDENTIFICATION	MANUFACTURER
AC		ALUMINUM COMPANY OF AMERICA (ALCOA)
AC101	F-1	1501 ALCOA BUILDING
AC102	F-5	PITTSBURGH, PA. 15219
AC103	F-6	PHONE (412)553-4545
AC104	H-151	
AC301	T-61	
AC302	T-71	
AC303	F-7	
AC		
AL		AMERICAN LAVA CORPORATION
AL101	ALSIMAG 614-HC	CHATTANOOGA, TENNESSEE 37405
AL102	ALSIMAG 795-HC	PHONE (615)265-3411
AL		
BC		BARNEBEY-CHENEY
BC101	RESORB	E. 8 AVENUE AND N. CASSIDY ST.
BC		COLUMBUS, OHIO 43219
BC		PHONE (614)258-9501
BC		
CA		CATALYSTS AND CHEMICALS, INC.
CA102	C-11	1227 SOUTH 12 STREET
CA103	C-12	LOUISVILLE, KY. 40210
CA104	C-13	PHONE (502)637-9746
CA105	C-18	
CA201	C-101	
CA301	C-31-2	
CA302	C31-1	
CA303	C31-1A	
CA304	C35	
CA305	C36	
CA306	C49	
CA401	C20	
CA601	C73	
CA701	C14	
CA702	C15	
CA801	C54	
CA		
CC		CARBORUNDUM COMPANY
CC101	SAHT-99	TECHNICAL CERAMICS PLANT
CC201	**	P.O. BOX 311
CC301	AAMC	LATROBEL PA. 15650
CC302	AAMO	PHONE (412)KE7-3331
CC303	AAMT-80	**CARBON-ON-ALUMINA FLUID-BED CATALYST
CC304	AAMT-88	
CC305	AELT	
CC306	ALC	
CC307	AMC	
CC308	AMM	
CC309	AMO	
CC310	AMT	
CC311	CELT	

```
CC312   CHO
CC313   CHT
CC314   CLC
CC315   CLO
CC316   CLT
CC317   CMC
CC318   CMM
CC319   CMO
CC320   CMT
CC321   MLC
CC322   MMC
CC323   MMT
CC324   SAHO
CC325   SAHT-96
CC326   SAHT-99
CC327   SAMT-96
CC328   SEHT
CC329   SLC
CC330   SMC
CC331   SMT
CC332   SMT-94
CC333   SMT-95
CC334   ZLC
CC335   ZLT
CC336   ZRMT
CC337   SAEHS
CC338   SAEHS-18
CC339   SAEHS-3
CC340   SAEHS-33
CC341   SAEHS-MOD
CC342   SAEHS-5
CC
CY                          AMERICAN CYANAMID COMPANY
CY101   AEROCAT 80/90       REFINERY CHEMICALS DEPARTMENT
CY102   AEROCAT 75/85       BOUND BROOK, NEW JERSEY 08805
CY103   AEROCAT AAA           PHONE (201)356-2000
CY104   AEROCAT SSS-4
CY105   **                  **AEROCAT FLUID CRACKING CATALYST
CY201   AEROCAT TS-150
CY302   AERO HDS-3
CY401   AEROFORM PHF-4
CY501   AEROCAT PAA-3
CY601   AEROCAT SA
CY701   AERO HDS-2
CY702   AERO HDS-2A
CY
DG                          DAVISON CHEMICAL DIVISION
DG101    GRADE 01           W. R. GRACE AND COMPANY
DG102    GRADE 03           101 NORTH CHARLES STREET
DG103    GRADE 04           BALTIMORE, MARYLAND 21203
DG104    GRADE 05             PHONE (301)727-3900
DG105    GRADE 07
DG106    GRADE 08
DG107    GRADE 40
DG108    GRADE 41
DG109    GRADE 12
```

```
DG110   GRADE 14
DG111   GRADE 15
DG112   GRADE 58
DG113   GRADE 62
DG114   GRADE 922
DG115   GRADE 923
DG116   GRADE 950
DG117   GRADE 09
DG118   GRADE 17
DG119   GRADE 42
DG120   GRADE 43
DG121   GRADE 44
DG122   GRADE 16 327
DG123   GRADE 59
DG124   GRADE 63
DG125   GRADE 81
DG126   GRADE 91
DG127   GRADE 113
DG201   XZ-25
DG202   GRADE 970
DG203   GRADE RD-GEL
DG204   GRADE ID-GEL
DG205   GRADE 02
DG206   GRADE 56
DG208   GRADE 951
DG209   GRADE 952
DG210   **                  **SILICA-MAGNESIA CATALYST
DG211   GRADE 979
DG212   $$                  $$GRADE 980 13% ALUMINA
DG213   //                  //GRADE 980 25% ALUMINA
DG301   3A
DG302   5A
DG303   4A
DG304   13X
DG305   AR12-22
DG
DP                          E. I. DUPONT DE NEMOURS AND COMPANY
DP101   **                  INDUSTRIAL AND BIOCHEMICALS DEPARTMENT
DP102   $$                  NEW VENTURES GROUP--CHESTNUT RUN
DP                          WILMINGTON, DELAWARE 19893
DP                             PHONE (302)PR4-2421
DP                          **TORVEX (REG.TRADE.), ALUMINA HONEYCOMB
DP                          $$TORVEX (REG.TRADE.), MULLITE HONEYCOMB
DP
EN                          MINERALS AND CHEMICALS DIVISION
EN101   **                  ENGELHARD MINERALS AND CHEMICALS CORPORATION
EN201   POROCEL $$          MENLO PARK, NEW JERSEY 08817
EN202   POROCEL-REG           PHONE (201)548-2200
EN203   POROCEL-LO FE       **CALLED KAOLIN CRACKING CATALYST
EN204   POROCEL-LO SI       $$ACTIVATED BAUXITE DESULFURIZATION CATALYST
EN205   //                  //POROCEL-LPD SULFUR RECOVERY CATALYST
EN206   DRIOCEL
EN207   DRIOCEL S
EN208   CYCLOCEL
EN
EP                          EAGLE-PICHER INDUSTRIES
```

```
EP101   CELATOM MP-95   1100 AMERICAN BUILDING
EP102   CELATOM MP-99   CINCINNATI,OHIO 45202
EP                        PHONE (452)721-7010
EP
GR                      GIRDLER CATALYSTS, CHEMETRON CHEMICALS
GR101   G-43            DIV. OF CHEMETRON CORPORATION
GR202   G-32E           4900 CRITTENDON DRIVE
GR301   G-51            P.O. BOX 337
GR401   G56             LOUISVILLE,KY. 40201
GR402   G29               PHONE (502)366-9541
GR403   G31
GR404   G3
GR405   G66
GR406   G33
GR407   G65
GR409   G35
GR411   G41
GR412   G42
GR413   G72
GR414   G39
GR415   G63
GR416   G74
GR417   G75
GR419   G73
GR420   G58
GR421   G55
GR422   G68
GR424   G24 AND G28
GR425   G67
GR426   G62
GR427   G61
GR428   G13
GR429   G22
GR430   G49
GR431   G69
GR432   G60
GR433   G71
GR434   G81
GR435   ICI 35-4
GR436   G47
GR437   G64
GR438   G48
GR439   G32
GR440   G77
GR
HC                      HOUDRY PROCESS AND CHEMICAL COMPANY
HC201   **              DIV. OF AIR PRODUCTS AND CHEMICALS, INC.
HC202   $$              1339 CHESTNUT STREET
HC203   //              PHILADELPHIA, PENNSYLVANIA 19107
HC204   HZ-1              PHONE (215)LO8-6000
HC205   ((              **CHROME-ALUMINA CATALYST,SERIES A, GRADE 25Z
HC206   ))              $$COBALT-MOLYBDATE CATALYST,SERIES C
HC207   *$              //HOUDRY HARD ALUMINA
HC208   $/              ((KAOLIN, GRADE A
HC209   $*              ))PALLADIUM-CARBON POWDER CATALYSTS
HC                      *$PLATINUM-ALUMINA CATALYST,SERIES A, GRADE 100S
HC                         $/PLATINUM-ALUMINA CATALYST, TYPE 3G
HC                         $*SYNTHETIC SILICA-ALUMINA CATALYSTS
HC
HS                         HARSHAW CHEMICAL COMPANY
HS101   AL-0104T           DIV. OF KEWANEE OIL COMPANY
HS102   AL-1404T           1933EAST 97 STREET
HS103   AL-1906E           CLEVELAND, OHIO 44106
HS104   AL-1802E             PHONE (216)721-8300
HS105   AL-1706E
HS106   CO-0301E
HS107   CO-0901T
HS108   COMO-0401T
HS109   COMO-0603T
HS110   COMO-0601T
HS111   CR-0101T
HS112   CR-0205T
HS113   CU-1407T
HS114   CU-1900S
HS115   MG-0601T
HS116   FE-1401S
HS117   MO-0401P
HS118   MN-0201T
HS119   NI-0304T
HS120   NI-4405E
HS121   V-0701T
HS122   V-0601T
HS123   V-0501S
HS124   ZN-0103T
HS125   ZN-0302T
HS126   AG0101E
HS127   AL0101P
HS128   AL0102P
HS129   AL0109P
HS130   AL1401P
HS131   AL1605P
HS132   BA0108E
HS133   CO-0101T
HS134   CO-0108T
HS135   CO-0401G4-8
HS136   CO-0402G4-8
HS137   CO-0403G4-8
HS138   CO-0501T
HS139   CO-0502T
HS140   CO-0402T
HS141   CR0103T
HS142   CR0104T
HS143   CR0105T
HS144   CR0304T
HS145   CR1404P
HS146   CR1404T
HS147   CU0202P
HS148   CU0203T
HS149   CU0401P
HS150   CU0402T
HS151   CU1106P
HS152   CU1107T
```

HS153	CU1110P
HS154	CU1402P
HS156	CU1800P
HS157	CU1808T
HS158	CU2000P
HS159	CU0307T
HS160	CU0803T
HS161	CU0804T
HS162	CU0905P
HS163	CU0905T
HS164	CU1700T
HS165	CU2501G4-10
HS166	FE0301T
HS167	FE0303P
HS171	MN0501G3-8
HS173	MO-0502T
HS174	MO1101P
HS175	MO1201T
HS176	NI0101T
HS177	NI0102T
HS178	NI0104G
HS179	NI0104P
HS180	NI0104T
HS181	NI0107T
HS182	NI0108T
HS183	NI0109F
HS184	NI0109T
HS185	NI0116T
HS186	NI0122E
HS187	NI0301T
HS188	NI0302T
HS189	NI0502F
HS190	NI0704E
HS191	NI0707T
HS192	NI0901S
HS193	NI0910S
HS194	NI0912S
HS195	NI0914R
HS196	NI1000P
HS197	NI1404T
HS198	NI1406T
HS199	NI1430E
HS200	NI1501S
HS201	NI1600S
HS202	NI1601T
HS203	NI1800G4-6
HS204	NI1901G2-1
HS205	NI2002C1
HS206	NI3001T
HS207	NI3201F
HS208	NI5000F
HS209	NI4301E
HS210	NI4401E
HS211	NI4403E
HS212	NI4303E
HS213	NI4305E

```
HS214   PD0501T
HS215   PD0505T
HS216   PD0509T
HS217   TI0102T
HS218   V0301T
HS219   V0802S
HS220   V1001E
HS221   V1002E
HS222   W0101T
HS223   W0602T
HS224   W0801T
HS225   ZN0311T
HS226   ZN0311T
HS227   ZN0312T
HS228   ZN0401E
HS229   ZN0601T
HS230   ZN0602T
HS231   ZN0701T
HS232   ZR0304T
HS233   ZN0803G4-10
HS234   AL1602T
HS
KC                                 KAISER CHEMICALS
KC101   KA-201                     DIV. OF KAISER ALUMINUM AND CHEMICAL CORPORATION
KC                                 300 LAKESIDE DRIVE
KC                                 OAKLAND, CALIFORNIA 94604
KC                                   PHONE (415)CR1-2211
KC
MB                                 MATHEY BISHOP, INC.
MB101   THT                        APPARATUS AND SYSTEMS DIVISION
MB                                 MALVERN, PENNSYLVANIA 19355
MB                                   PHONE (215)644-3100
MB
MN                                 MONSANTO COMPANY
MN101   TYPE 210                   800 N. LINDBERGH BOULEVARD
MN102   TYPE 11                    ST.LOUIS, MISSOURI 63166
MN103   TYPE 29                      PHONE (314)OX4-1000
MN
NC                                 NORTON COMPANY
NC101   **                         50 NEW BOND STREET
NC                                 WORCESTER, MASS. 01606
NC                                   PHONE (617)853-1000
NC                                 **ZEOLON SYNTHETIC ZEOLITE, HYDROGEN FORM
NC
NL                                 NALCO CHEMICAL COMPANY
NL101   **                         CATALYST DIVISION
NL102   $$                         401 WEST 71 STREET
NL103   NALCAT 783                 CHICAGO, ILLINOIS
NL104   NALCAT 783S                  PHONE (312)767-6677
NL105   NALCAT KSF                 **FLUID CRACKING CATALYST, NALCAT LOW ALUMINA
NL106   NALCAT KSG                 $$FLUID CRACKING CATALYST, NALCAT HIGH ALUMINA
NL107   NALCOMO 471
NL108   NALCOMO 474
NL109   NALCO NM-501
NL110   NALCO NM-502
NL111   NALCO NI-W
```

```
NL112     //                  //ALUMINA BASE CARRIER
NL113     NALCAT ND-12
NL
RM                            REYNOLDS METALS COMPANY
RM101     RA-1                REYNOLDS METALS BUILDING
RM                            RICHMOND, VIRGINIA 23218
RM                               PHONE (703)AT2-2311
RM
UA                            UNIVERSAL OIL PRODUCTS,
UA101     OX-1                AIR CORRECTION DIVISION
UA102     OX-2                TOKENEKE ROAD
UA103     **                  DARIEN, CONNECTICUTT 06820
UA                               PHONE (203)655-8711
UA                            **FABRICATED METAL UNITS PREPARED BY ELECTROCHEMICAL
UA                              DEPOSITION OF COATINGS WHICH CONTAIN ACTIVE METALS
UA                              (NO NAME GIVEN).
UA
UC                            LINDE DIVISION
UC101     AW300               UNION CARBIDE CORPORATION
UC201     5A                  270 PARK AVENUE
UC202     13X                 NEW YORK, NEW YORK 10017
UC203     3A                     PHONE (212)551-2345
UC204     4A
UC301     SK100
UC302     SK110
UC303     SK200
UC304     SK300
UC305     SK310
UC306     SK400
UC307     SK410
UC402     SK500
UC501     SK-120
UC
XY                            OXY-CATALYST, INC.
XY101     OXY-COMB            EAST BIDDLE STREET
XY                            WEST CHESTER, PENNSYLVANIA 19380
X                                PHONE (215)692-3500
XY
```

APPENDIX F

BLITZ TABLES: THE AVAILABLE INFORMATION FOR EACH MATERIAL

```
MATERIAL CODE AC101                                          MATERIAL CODE AC101

       CLASSIFICATION  1      -0.000 SOR, ACTIVATED ALUMINA
          COMPOSITION  2       0.000 AL2O3 92%, NA2O 0.9%
     COST, 2CD ACTIVE  3     245.000 NA2O .9%
      AVAILABLE SIZES  4      -0.000 1/4 INCH TO 8 MESH
     AVAILABLE SHAPES  5       0.000 GRANULES
       CRUSH STRENGTH  6      55.000
             HARDNESS  7       0.000
            PORE SIZE  8       0.000
          PORE VOLUME  9       0.000
         SURFACE AREA 10     210.000
         BULK DENSITY 11      55.000
       CRYSTALLINITY 12        0.000
     CRYSTALLITE SIZE 13       0.000
           MAJOR USES 14       0.000 DRYING GASES AND LIQUIDS
           MAJOR USES 15       0.000 MAINTENANCE OF TRANSFORMER OIL
           VOLATILITY 16       6.500 1100C
     PARTICLE DENSITY 17       0.000
       MAX. OP. TEMP. 18     350.000 REACTIVATION TEMP
            ATTRITION 19       0.000
             COMMENTS 20       0.000


MATERIAL CODE AC102                                          MATERIAL CODE AC102

       CLASSIFICATION  1      -0.000 SOR, ACTIVATED ALUMINA
          COMPOSITION  2       0.000 AL2O3 77%, NA2O 0.8% CACL2 9.3
     COST, 2CD ACTIVE  3     429.000 CACL2 9.3%
      AVAILABLE SIZES  4       0.000 1/2 TO 1/4 INCH
     AVAILABLE SHAPES  5       0.000 GRANULES
       CRUSH STRENGTH  6       0.000
             HARDNESS  7       0.000
            PORE SIZE  8       0.000
          PORE VOLUME  9       0.000
         SURFACE AREA 10       0.000
         BULK DENSITY 11      58.000
       CRYSTALLINITY 12        0.000
     CRYSTALLITE SIZE 13       0.000
           MAJOR USES 14       0.000
           MAJOR USES 15       0.000
           VOLATILITY 16      12.400 1100C
     PARTICLE DENSITY 17       0.000
       MAX. OP. TEMP. 18       0.000
            ATTRITION 19       0.000
             COMMENTS 20       0.000
```

```
MATERIAL CODE AC103                                    MATERIAL CODE AC103

     CLASSIFICATION  1       -0.000 SOR,ACTIVATED ALUMINA
        COMPOSITION  2       -0.000 AL203 88, NA20 .86, COCL2 2.0%
   COST, 2CD ACTIVE  3      491.000 COCL2
    AVAILABLE SIZES  4       -0.000 1/4 IN. TO 8 MESH
   AVAILABLE SHAPES  5       -0.000 GRANULAR
     CRUSH STRENGTH  6        0.000
           HARDNESS  7        0.000
          PORE SIZE  8        0.000
        PORE VOLUME  9        0.000
       SURFACE AREA 10        0.000
       BULK DENSITY 11       57.000
      CRYSTALLINITY 12        0.000
   CRYSTALLITE SIZE 13        0.000
         MAJOR USES 14       -0.000 BREATHER EQUIP. + APPLIC. REQ.
         MAJOR USES 15       -0.000 VISIBLE IND. OF ADSORPTION
         VOLATILITY 16        8.500
   PARTICLE DENSITY 17        0.000
     MAX. OP. TEMP. 18        0.000
          ATTRITION 19        0.000
           COMMENTS 20        0.000

MATERIAL CODE AC104                                    MATERIAL CODE AC104

     CLASSIFICATION  1       -0.000 SOR, ALUMINA GEL
        COMPOSITION  2       -0.000 AL203 90, SI02 2.2, NA20 1.6%
   COST, 2CD ACTIVE  3      416.000 SI02
    AVAILABLE SIZES  4       -0.000 1/8 IN. + 1/4 IN. DIA. BALLS
   AVAILABLE SHAPES  5       -0.000 BALLS
     CRUSH STRENGTH  6       75.000
           HARDNESS  7        0.000
          PORE SIZE  8        0.000
        PORE VOLUME  9        0.000
       SURFACE AREA 10      390.000
       BULK DENSITY 11       53.000
      CRYSTALLINITY 12        0.000
   CRYSTALLITE SIZE 13        0.000
         MAJOR USES 14       -0.000 DRYING GASSES UNDER HIGH PRESS
         MAJOR USES 15       -0.000 + STATIC DRYING APPLICATIONS
         VOLATILITY 16        6.000
   PARTICLE DENSITY 17        0.000
     MAX. OP. TEMP. 18     1250.000
          ATTRITION 19        0.000
           COMMENTS 20       -0.000 NONTOXIC
```

```
MATERIAL CODE AC301                                          MATERIAL CODE AC301

       CLASSIFICATION  1      -0.000 CRR, ALUMINA, CATALYTIC GRADE
          COMPOSITION  2      -0.000 MGO,AL203,SIO2
     COST, 2CD ACTIVE  3      92.000 NONE
      AVAILABLE SIZES  4      -0.000 1/4 INCH TO 8 MESH
     AVAILABLE SHAPES  5       0.000 GRANULAR
       CRUSH STRENGTH  6       0.000
             HARDNESS  7       0.000
            PORE SIZE  8       0.000
          PORE VOLUME  9        .015
         SURFACE AREA 10        .040
         BULK DENSITY 11     130.000
        CRYSTALLINITY 12       0.000
     CRYSTALLITE SIZE 13       0.000
           MAJOR USES 14       0.000 REFORMING,CRACKING
           MAJOR USES 15       0.000
           VOLATILITY 16       0.000
     PARTICLE DENSITY 17       0.000
       MAX. OP. TEMP. 18       0.000
            ATTRITION 19       0.000
             COMMENTS 20       0.000

MATERIAL CODE AC302                                          MATERIAL CODE AC302

       CLASSIFICATION  1      -0.000 CAT, TABLETED ALUMINA
          COMPOSITION  2      -0.000 AL203 99.5%, SO3 .09, CAO .06%
     COST, 2CD ACTIVE  3     555.000 CAO .06
      AVAILABLE SIZES  4       0.000
     AVAILABLE SHAPES  5      -0.000 GRANULAR
       CRUSH STRENGTH  6       0.000
             HARDNESS  7       0.000
            PORE SIZE  8       0.000
          PORE VOLUME  9        .175
         SURFACE AREA 10        .500
         BULK DENSITY 11      85.000
        CRYSTALLINITY 12       0.000
     CRYSTALLITE SIZE 13       0.000
           MAJOR USES 14      -0.000 LOW-SURFACE-AREA CATALYST
           MAJOR USES 15      -0.000 AGGREGATE(CASTABLE REFRACTORY)
           VOLATILITY 16       0.000
     PARTICLE DENSITY 17       0.000
       MAX. OP. TEMP. 18       0.000
            ATTRITION 19       0.000
             COMMENTS 20      -0.000 AVAIL. AS CONVERTER DISCHARGE.
```

```
MATERIAL CODE AC303                                      MATERIAL CODE AC303

      CLASSIFICATION  1      -0.000 CAT. ACTIVATED ALUMINA
         COMPOSITION  2      -0.000 AL203 84%, NICKEL FORMATE 2.5%
     COST, 2CD ACTIVE  3    500.000 NICKEL FORMATE
     AVAILABLE SIZES  4       0.000
    AVAILABLE SHAPES  5      -0.000 GRANULAR
      CRUSH STRENGTH  6       0.000
            HARDNESS  7       0.000
           PORE SIZE  8       0.000
         PORE VOLUME  9       0.000
        SURFACE AREA 10       0.000
        BULK DENSITY 11      55.000
       CRYSTALLINITY 12       0.000
    CRYSTALLITE SIZE 13       0.000
          MAJOR USES 14      -0.000 CATALYST(PROD. OF CONTROLLED
          MAJOR USES 15      -0.000 ATMOS. IN HEAT-TREATING FURN.)
          VOLATILITY 16      12.100
    PARTICLE DENSITY 17       0.000
      MAX. OP. TEMP. 18       0.000
           ATTRITION 19       0.000
            COMMENTS 20      -0.000 GRADE F-1 + NICKEL FORMATE


MATERIAL CODE AL101                                      MATERIAL CODE AL101

      CLASSIFICATION  1      -0.000 CRR, HONEYCOMB, ALUMINA
         COMPOSITION  2      -0.000 ALUMINA 96% (ALSIMAG 614)
     COST, 2CD ACTIVE  3   7600.000 NONE
     AVAILABLE SIZES  4      -0.000 CELLS 1,1/3,1/5 INCH
    AVAILABLE SHAPES  5      -0.000 BLOCKS 8X8X2 INCH
      CRUSH STRENGTH  6       0.000
            HARDNESS  7       0.000
           PORE SIZE  8       0.000
         PORE VOLUME  9       0.000
        SURFACE AREA 10       0.000
        BULK DENSITY 11       0.000
       CRYSTALLINITY 12       0.000
    CRYSTALLITE SIZE 13       0.000
          MAJOR USES 14      -0.000 NOX FUME ABATEMENT
          MAJOR USES 15      -0.000 HCN REACTOR
          VOLATILITY 16       0.000
    PARTICLE DENSITY 17       0.000
      MAX. OP. TEMP. 18       0.000
           ATTRITION 19       0.000
            COMMENTS 20      -0.000 SUPPLY ENGELHARD.OXY-CATALYST
```

```
MATERIAL CODE AL102                                          MATERIAL CODE AL102

       CLASSIFICATION  1      -0.000 CRR, CORDIERITE
          COMPOSITION  2       0.000 MGO.AL203.(5/2SIO2)
     COST, 2CD ACTIVE  3    4350.000 NONE
      AVAILABLE SIZES  4      -0.000 9IN. BY 9IN. BY 4IN.
     AVAILABLE SHAPES  5      -0.000 EXTRUDED
       CRUSH STRENGTH  6       0.000
             HARDNESS  7       8.000 MOH SCALE
            PORE SIZE  8       0.000
          PORE VOLUME  9       0.000
         SURFACE AREA 10       0.000
         BULK DENSITY 11       0.000
        CRYSTALLINITY 12       0.000
     CRYSTALLITE SIZE 13       0.000
           MAJOR USES 14      -0.000 CARRIER IN HCN REACTOR
           MAJOR USES 15      -0.000 NOX FUME ABATEMENT EQUIPMENT
           VOLATILITY 16       0.000
     PARTICLE DENSITY 17     143.500
       MAX. OP. TEMP. 18       0.000
            ATTRITION 19       0.000
             COMMENTS 20       0.000


MATERIAL CODE BC101                                          MATERIAL CODE BC101

       CLASSIFICATION  1      -0.000 SOR, ACTIVATED CARBON
          COMPOSITION  2      -0.000 CARBON
     COST, 2CD ACTIVE  3    2000.000 NONE
      AVAILABLE SIZES  4       0.000
     AVAILABLE SHAPES  5       0.000
       CRUSH STRENGTH  6       0.000
             HARDNESS  7       0.000
            PORE SIZE  8       0.000
          PORE VOLUME  9       0.000
         SURFACE AREA 10       0.000
         BULK DENSITY 11       0.000
        CRYSTALLINITY 12       0.000
     CRYSTALLITE SIZE 13       0.000
           MAJOR USES 14      -0.000 REMOVES TOXIC GASES FROM AIR
           MAJOR USES 15       0.000
           VOLATILITY 16       0.000
     PARTICLE DENSITY 17       0.000
       MAX. OP. TEMP. 18       0.000
            ATTRITION 19       0.000
             COMMENTS 20       0.000
```

```
MATERIAL CODE CA102                                        MATERIAL CODE CA102

          CLASSIFICATION  1        -0.000 CAT, NICKEL ON REFRACTORY
             COMPOSITION  2        -0.000 NIO 20-40%; REFRACTORIES-BAL.
        COST, 2CD ACTIVE  3      1810.000 NONE
         AVAILABLE SIZES  4        -0.000 1/2X1/2, 3/4X3/4 INCHES
        AVAILABLE SHAPES  5        -0.000 CYLINDERS; RINGS
          CRUSH STRENGTH  6         0.000
                HARDNESS  7         0.000
               PORE SIZE  8         0.000
             PORE VOLUME  9         0.000
            SURFACE AREA 10         0.000
            BULK DENSITY 11        60.000
          CRYSTALLINITY 12          0.000
        CRYSTALLITE SIZE 13         0.000
              MAJOR USES 14        -0.000 MFG. NH3, STEAM REFORMING
              MAJOR USES 15         0.000
              VOLATILITY 16         0.000
        PARTICLE DENSITY 17         0.000
          MAX. OP. TEMP. 18      2400.000
               ATTRITION 19         0.000
                COMMENTS 20         0.000
```

```
MATERIAL CODE CA103                                        MATERIAL CODE CA103

          CLASSIFICATION  1        -0.000 CAT, IRON+CHROMIUM OXIDES
             COMPOSITION  2        -0.000 FE2O3 77-81%; CR2O3 9-11%
        COST, 2CD ACTIVE  3       586.000 CR2O3 9-11%
         AVAILABLE SIZES  4        -0.000 3/8X1/4 AND 1/4X1/4 INCH
        AVAILABLE SHAPES  5        -0.000 TABLETS
          CRUSH STRENGTH  6         0.000
                HARDNESS  7         0.000
               PORE SIZE  8         0.000
             PORE VOLUME  9         0.000
            SURFACE AREA 10         0.000
            BULK DENSITY 11        60.000
          CRYSTALLINITY 12          0.000
        CRYSTALLITE SIZE 13         0.000
              MAJOR USES 14        -0.000 PRODUCE HYDROGEN
              MAJOR USES 15         0.000
              VOLATILITY 16         0.000
        PARTICLE DENSITY 17         0.000
          MAX. OP. TEMP. 18      1100.000
               ATTRITION 19         0.000
                COMMENTS 20         0.000
```

```
MATERIAL CODE CA104                                              MATERIAL CODE CA104

       CLASSIFICATION  1        -0.000 CAT, NICKEL OXIDE ON ALUMINA
          COMPOSITION  2        -0.000 NIO 30-70%; CARRIER BAL.
     COST, 2CD ACTIVE  3      1510.000 NONE
      AVAILABLE SIZES  4        -0.000 1/4X1/4, 3/8X1/4
     AVAILABLE SHAPES  5        -0.000 TABLETS; EXTRUSIONS
       CRUSH STRENGTH  6         0.000
             HARDNESS  7         0.000
            PORE SIZE  8         0.000
          PORE VOLUME  9         0.000
         SURFACE AREA 10         0.000
         BULK DENSITY 11        25.000 MINIMUM, 68. MAXIMUM
        CRYSTALLINITY 12         0.000
     CRYSTALLITE SIZE 13         0.000
           MAJOR USES 14        -0.000 METHANATION
           MAJOR USES 15         0.000
           VOLATILITY 16         0.000
     PARTICLE DENSITY 17         0.000
       MAX. OP. TEMP. 18       750.000
            ATTRITION 19         0.000
             COMMENTS 20         0.000


MATERIAL CODE CA105                                              MATERIAL CODE CA105

       CLASSIFICATION  1        -0.000 CAT, CU,ZN,AL OXIDES ON BASE
          COMPOSITION  2        -0.000 CU,ZN,AL OXIDES
     COST, 2CD ACTIVE  3      1667.000 ZN OXIDES
      AVAILABLE SIZES  4        -0.000 1/4X1/4 AND 3/16X3/16 INCH
     AVAILABLE SHAPES  5        -0.000 TABLETS
       CRUSH STRENGTH  6         0.000
             HARDNESS  7         0.000
            PORE SIZE  8         0.000
          PORE VOLUME  9         0.000
         SURFACE AREA 10         0.000
         BULK DENSITY 11        80.000
        CRYSTALLINITY 12         0.000
     CRYSTALLITE SIZE 13         0.000
           MAJOR USES 14        -0.000 PRODUCE HYDROGEN
           MAJOR USES 15         0.000
           VOLATILITY 16         0.000
     PARTICLE DENSITY 17         0.000
       MAX. OP. TEMP. 18       600.000
            ATTRITION 19         0.000
             COMMENTS 20         0.000
```

```
MATERIAL CODE CA201                                             MATERIAL CODE CA201

      CLASSIFICATION  1        -0.000 CAT, VANADIA, K-PROMOTED
         COMPOSITION  2        -0.000 V205 9-10%, K20 14-15%
   COST, 2CD ACTIVE   3      1245.000 K20 14-15%
     AVAILABLE SIZES  4        -0.000 3/16 AND 1/4X1/4
    AVAILABLE SHAPES  5        -0.000 EXTRUSIONS AND TABLETS
      CRUSH STRENGTH  6         0.000
            HARDNESS  7         0.000
           PORE SIZE  8         0.000
         PORE VOLUME  9         0.000
        SURFACE AREA 10         0.000
        BULK DENSITY 11        49.000 EXTRUSION, 56.TABLET
       CRYSTALLINITY 12         0.000
    CRYSTALLITE SIZE 13         0.000
          MAJOR USES 14        -0.000 H2SO4 CONTACT CATALYST
          MAJOR USES 15         0.000
          VOLATILITY 16         0.000
    PARTICLE DENSITY 17         0.000
     MAX. OP. TEMP.  18       800.000
           ATTRITION 19         0.000
            COMMENTS 20         0.000


MATERIAL CODE CA301                                             MATERIAL CODE CA301

      CLASSIFICATION  1        -0.000 CAT, PALLADIUM ON ALUMINA
         COMPOSITION  2        -0.000 PALLADIUM 0.09-0.11%
   COST, 2CD ACTIVE   3      3550.000 NONE
     AVAILABLE SIZES  4        -0.000 1/8 INCH EXT., 4X8 MESH SPHERE
    AVAILABLE SHAPES  5        -0.000 EXTRUSIONS,SPHERES
      CRUSH STRENGTH  6         0.000
            HARDNESS  7         0.000
           PORE SIZE  8         0.000
         PORE VOLUME  9         0.000
        SURFACE AREA 10         0.000
        BULK DENSITY 11        25.000 EXTRUSIONS,40 SPHERES
       CRYSTALLINITY 12         0.000
    CRYSTALLITE SIZE 13         0.000
          MAJOR USES 14        -0.000 HYDROGENATION
          MAJOR USES 15         0.000
          VOLATILITY 16         0.000
    PARTICLE DENSITY 17         0.000
     MAX. OP. TEMP.  18       250.000
           ATTRITION 19         0.000
            COMMENTS 20        -0.000 2-YEAR EXPECTED LIFE
```

```
MATERIAL CODE CA302                                    MATERIAL CODE CA302

      CLASSIFICATION  1      -0.000 CAT, PALLADIUM ON ALUMINA
         COMPOSITION  2      -0.000 PD 0.045-0.055%, AL203 BALANCE
     COST, 2CD ACTIVE  3   2000.000 NONE
      AVAILABLE SIZES  4      -0.000 1/8 INCH; 4X8 MESH
     AVAILABLE SHAPES  5      -0.000 EXTRUSIONS; SPHERES
       CRUSH STRENGTH  6       0.000
             HARDNESS  7       0.000
            PORE SIZE  8       0.000
          PORE VOLUME  9       0.000
         SURFACE AREA 10       0.000
         BULK DENSITY 11      25.000 FOR EXTRUSIONS; 40. FOR SPHERE
        CRYSTALLINITY 12       0.000
     CRYSTALLITE SIZE 13       0.000
           MAJOR USES 14      -0.000 HYDROGENATION
           MAJOR USES 15       0.000
           VOLATILITY 16       0.000
     PARTICLE DENSITY 17       0.000
       MAX. OP. TEMP. 18     450.000
            ATTRITION 19       0.000
             COMMENTS 20      -0.000 3-YEAR EXPECTED LIFE

MATERIAL CODE CA303                                    MATERIAL CODE CA303

      CLASSIFICATION  1      -0.000 CAT, PALLADIUM ON ALUMINA
         COMPOSITION  2      -0.000 PD 0.045-0.055%, AL203 BALANCE
     COST, 2CD ACTIVE  3   1820.000 NONE
      AVAILABLE SIZES  4      -0.000 1/8 INCH; 4X8 MESH
     AVAILABLE SHAPES  5      -0.000 EXTRUSIONS; SPHERES
       CRUSH STRENGTH  6       0.000
             HARDNESS  7       0.000
            PORE SIZE  8       0.000
          PORE VOLUME  9       0.000
         SURFACE AREA 10       0.000
         BULK DENSITY 11      25.000 FOR EXTRUSIONS; 48. FOR SPHERE
        CRYSTALLINITY 12       0.000
     CRYSTALLITE SIZE 13       0.000
           MAJOR USES 14      -0.000 HYDROGENATION
           MAJOR USES 15       0.000
           VOLATILITY 16       0.000
     PARTICLE DENSITY 17       0.000
       MAX. OP. TEMP. 18     300.000
            ATTRITION 19       0.000
             COMMENTS 20      -0.000 3-YEAR EXPECTED LIFE
```

```
MATERIAL CODE CA304                                        MATERIAL CODE CA304

           CLASSIFICATION  1      -0.000 CAT; PALLADIUM ON SPECIAL CRR.
              COMPOSITION  2      -0.000 NOT GIVEN
        COST, 2CD ACTIVE   3    4050.000 NONE
          AVAILABLE SIZES  4      -0.000 4X8 MESH
         AVAILABLE SHAPES  5      -0.000 SPHERES
           CRUSH STRENGTH  6       0.000
                 HARDNESS  7       0.000
                PORE SIZE  8       0.000
              PORE VOLUME  9       0.000
             SURFACE AREA 10       0.000
             BULK DENSITY 11      40.000
           CRYSTALLINITY  12       0.000
         CRYSTALLITE SIZE 13       0.000
               MAJOR USES 14      -0.000 SELECTIVE HYDROGENATION
               MAJOR USES 15       0.000
               VOLATILITY 16       0.000
         PARTICLE DENSITY 17       0.000
           MAX. OP. TEMP. 18     200.000
                ATTRITION 19       0.000
                 COMMENTS 20      -0.000 3-YEAR EXPECTED LIFE
```

```
MATERIAL-CODE CA305                                        MATERIAL CODE CA305

           CLASSIFICATION  1      -0.000 CAT, NI,CO,CR ON ALUMINA
              COMPOSITION  2      -0.000 NI,CO,CR,ALUMINA
        COST, 2CD ACTIVE   3    3000.000 CO, CR
          AVAILABLE SIZES  4      -0.000 1/3 INCH
         AVAILABLE SHAPES  5      -0.000 SPHERES
           CRUSH STRENGTH  6       0.000
                 HARDNESS  7       0.000
                PORE SIZE  8       0.000
              PORE VOLUME  9       0.000
             SURFACE AREA 10       0.000
             BULK DENSITY 11      48.000
           CRYSTALLINITY  12       0.000
         CRYSTALLITE SIZE 13       0.000
               MAJOR USES 14      -0.000 SELECTIVE HYDROGENATION
               MAJOR USES 15       0.000
               VOLATILITY 16       0.000
         PARTICLE DENSITY 17       0.000
           MAX. OP. TEMP. 18     600.000
                ATTRITION 19       0.000
                 COMMENTS 20      -0.000 5-YEAR EXPECTED LIFE
```

```
MATERIAL CODE CA306                                       MATERIAL CODE CA306

        CLASSIFICATION  1      -0.000 CAT,COO, MOO ON ALUMINA
           COMPOSITION  2      -0.000 COO,MOO,ALUMINA
      COST, 2CD ACTIVE  3    1715.000 COO, MOO
       AVAILABLE SIZES  4      -0.000 1/16X1/8 INCH
      AVAILABLE SHAPES  5      -0.000 EXTRUSIONS; TABLETS
        CRUSH STRENGTH  6       0.000
              HARDNESS  7       0.000
             PORE SIZE  8       0.000
           PORE VOLUME  9       0.000
          SURFACE AREA 10       0.000
          BULK DENSITY 11       0.000
        CRYSTALLINITY  12       0.000
      CRYSTALLITE SIZE 13       0.000
            MAJOR USES 14      -0.000 HYDROGENATION
            MAJOR USES 15       0.000
            VOLATILITY 16       0.000
      PARTICLE DENSITY 17       0.000
       MAX. OP. TEMP.  18     750.000
             ATTRITION 19       0.000
              COMMENTS 20       0.000

MATERIAL CODE CA401                                       MATERIAL CODE CA401

        CLASSIFICATION  1      -0.000 CAT, METAL OXIDES ON NA-AL2O3
           COMPOSITION  2      -0.000 CO-MO OXIDE, NI-MO OXIDE
      COST, 2CD ACTIVE  3    1400.000 CO-MO OXIDES
       AVAILABLE SIZES  4      -0.000 3/16 AND 1/4 IN. TABLETS
      AVAILABLE SHAPES  5      -0.000 EXTRUSIONS; TABLETS
        CRUSH STRENGTH  6       0.000
              HARDNESS  7       0.000
             PORE SIZE  8       0.000
           PORE VOLUME  9       0.000
          SURFACE AREA 10       0.000
          BULK DENSITY 11       0.000
        CRYSTALLINITY  12       0.000
      CRYSTALLITE SIZE 13       0.000
            MAJOR USES 14      -0.000 HYDROGENATION; HYDRODESULFURI-
            MAJOR USES 15      -0.000 ZATION; HYDRODENITRIFICATION
            VOLATILITY 16       0.000
      PARTICLE DENSITY 17       0.000
       MAX. OP. TEMP.  18     750.000
             ATTRITION 19       0.000
              COMMENTS 20      -0.000 1 TO 5-YEAR EXPECTED LIFE
```

```
MATERIAL CODE CA601                                              MATERIAL CODE CA601

       CLASSIFICATION  1        -0.000 CAT, MIXED OXIDES
          COMPOSITION  2        -0.000 FE,K,CA,AL OXIDES
     COST, 2CD ACTIVE  3       694.000 K,CA,AL OXIDES
      AVAILABLE SIZES  4        -0.000 6-10 MM
     AVAILABLE SHAPES  5        -0.000 GRANNULES
       CRUSH STRENGTH  6         0.000
             HARDNESS  7         0.000
            PORE SIZE  8         0.000
          PORE VOLUME  9         0.000
         SURFACE AREA 10         0.000
         BULK DENSITY 11       135.000 REDUCED; 170 NON-REDUCED
        CRYSTALLINITY 12         0.000
     CRYSTALLITE SIZE 13         0.000
          MAJOR USES 14        -0.000 SYNTHESIS OF AMMONIA
          MAJOR USES 15         0.000
          VOLATILITY 16         0.000
     PARTICLE DENSITY 17         0.000
       MAX. OP. TEMP. 18       950.000
            ATTRITION 19         0.000
             COMMENTS 20        -0.000 1-2 YEARS STORAGE;

MATERIAL CODE CA701                                              MATERIAL CODE CA701

       CLASSIFICATION  1        -0.000 CAT, NICKEL OXIDE ON ALUMINA
          COMPOSITION  2        -0.000 NI 4-7%; AL203 BALANCE
     COST, 2CD ACTIVE  3      2000.000 NONE
      AVAILABLE SIZES  4        -0.000 5/8X1-1/2 INCH
     AVAILABLE SHAPES  5        -0.000 IRREGULAR PARTICLES
       CRUSH STRENGTH  6         0.000
             HARDNESS  7         0.000
            PORE SIZE  8         0.000
          PORE VOLUME  9         0.000
         SURFACE AREA 10         0.000
         BULK DENSITY 11         0.000
        CRYSTALLINITY 12         0.000
     CRYSTALLITE SIZE 13         0.000
          MAJOR USES 14        -0.000 STEAM-HYDROCARBON REFORMING
          MAJOR USES 15         0.000
          VOLATILITY 16         0.000
     PARTICLE DENSITY 17         0.000
       MAX. OP. TEMP. 18      2300.000
            ATTRITION 19         0.000
             COMMENTS 20         0.000
```

```
MATERIAL CODE CA702                                      MATERIAL CODE CA702

       CLASSIFICATION  1       -0.000 CAT, CHROMIUM OXIDE ON ALUMINA
          COMPOSITION  2       -0.000 CR 4-8%; AL2O3 BALANCE
     COST, 2CD ACTIVE  3     2000.000 NONE
      AVAILABLE SIZES  4       -0.000 5/8X1-1/2 INCH
     AVAILABLE SHAPES  5       -0.000 IRREGULAR PARTICLES
       CRUSH STRENGTH  6        0.000
             HARDNESS  7        0.000
            PORE SIZE  8        0.000
          PORE VOLUME  9        0.000
         SURFACE AREA 10        0.000
         BULK DENSITY 11        0.000
       CRYSTALLINITY  12        0.000
     CRYSTALLITE SIZE 13        0.000
          MAJOR USES  14       -0.000 STEAM-HYDROCARBON REFORMING
          MAJOR USES  15        0.000
          VOLATILITY  16        0.000
     PARTICLE DENSITY 17        0.000
      MAX. OP. TEMP.  18     2600.000
           ATTRITION  19        0.000
            COMMENTS  20        0.000

MATERIAL CODE CA801                                      MATERIAL CODE CA801

       CLASSIFICATION  1       -0.000 CAT, NOBLE METAL ON ALUMINA
          COMPOSITION  2       -0.000 NOT GIVEN
     COST, 2CD ACTIVE  3     7750.000 NONE
      AVAILABLE SIZES  4        0.000
     AVAILABLE SHAPES  5        0.000
       CRUSH STRENGTH  6        0.000
             HARDNESS  7        0.000
            PORE SIZE  8        0.000
          PORE VOLUME  9        0.000
         SURFACE AREA 10        0.000
         BULK DENSITY 11        0.000
       CRYSTALLINITY  12        0.000
     CRYSTALLITE SIZE 13        0.000
          MAJOR USES  14       -0.000 REMOVAL OF O2 FROM N2, NH3 AND
          MAJOR USES  15       -0.000 INERT GASES
          VOLATILITY  16        0.000
     PARTICLE DENSITY 17        0.000
      MAX. OP. TEMP.  18        0.000
           ATTRITION  19        0.000
            COMMENTS  20       -0.000 SULFUR POISONS CATALYST
```

```
MATERIAL CODE CC101                                       MATERIAL CODE CC101

        CLASSIFICATION  1       -0.000 CRR, ALUMINA, GAS REFORMING
           COMPOSITION  2        0.000 AL2O3 99.5%, NA2O 0.45%
     COST, 2CD ACTIVE  3     1080.000 NA2O .45%
       AVAILABLE SIZES  4        0.000 3/16 TO 3/8 (SPHERE)
      AVAILABLE SHAPES  5        0.000 HOLLOW CYLINDER, SPHERES
        CRUSH STRENGTH  6      180.000
              HARDNESS  7        0.000
             PORE SIZE  8     4000.000
           PORE VOLUME  9        0.000
          SURFACE AREA 10        2.600
          BULK DENSITY 11       60.000
        CRYSTALLINITY 12        0.000
      CRYSTALLITE SIZE 13        0.000
            MAJOR USES 14        0.000 GAS REFORMING
            MAJOR USES 15        0.000
            VOLATILITY 16        0.000
      PARTICLE DENSITY 17        0.000
        MAX. OP. TEMP. 18        0.000
             ATTRITION 19        0.000
              COMMENTS 20       -0.000 RESISTANT TO STEAM AND H2

MATERIAL CODE CC201                                       MATERIAL CODE CC201

        CLASSIFICATION  1       -0.000 CRR, CARBON-ON-ALUMINA
           COMPOSITION  2        0.000 AL2O3 89%, CARBON 11%.
     COST, 2CD ACTIVE  3        0.000 NONE
       AVAILABLE SIZES  4        0.000
      AVAILABLE SHAPES  5        0.000
        CRUSH STRENGTH  6        0.000
              HARDNESS  7        0.000
             PORE SIZE  8       40.000
           PORE VOLUME  9         .210
          SURFACE AREA 10      200.000
          BULK DENSITY 11       66.000 TAPPED, 54 LOOSE
        CRYSTALLINITY 12        0.000
      CRYSTALLITE SIZE 13        0.000
            MAJOR USES 14        0.000
            MAJOR USES 15        0.000
            VOLATILITY 16        0.000
      PARTICLE DENSITY 17        0.000
        MAX. OP. TEMP. 18        0.000
             ATTRITION 19        0.000
              COMMENTS 20        0.000
```

```
MATERIAL CODE CC301                                    MATERIAL CODE CC301

      CLASSIFICATION  1        -0.000 CRR, ALUM. OXIDE,FUSED (WHITE)
         COMPOSITION  2        -0.000 AL203 88,SIO2 9,CAO 1,NA2O .52
    COST, 2CD ACTIVE  3      1920.000 CAO 1., NA2O .52
     AVAILABLE SIZES  4         0.000
    AVAILABLE SHAPES  5        -0.000 PELLETS
      CRUSH STRENGTH  6         0.000
            HARDNESS  7         0.000
           PORE SIZE  8    280000.000
         PORE VOLUME  9         0.000
        SURFACE AREA 10          .079
        BULK DENSITY 11        66.000
       CRYSTALLINITY 12         0.000
    CRYSTALLITE SIZE 13         0.000
          MAJOR USES 14         0.000
          MAJOR USES 15         0.000
          VOLATILITY 16         0.000
    PARTICLE DENSITY 17       129.740
      MAX. OP. TEMP. 18         0.000
           ATTRITION 19         8.000
            COMMENTS 20        -0.000 MEDIUM POROSITY,COARSE GRANULE

MATERIAL CODE CC302                                    MATERIAL CODE CC302

      CLASSIFICATION  1        -0.000 CRR, ALUM. OXIDE,FUSED (WHITE)
         COMPOSITION  2        -0.000 AL203 89,SIO2 9,CAO .6, BAO .5
    COST, 2CD ACTIVE  3      1260.000 CAO .6, BAO .5
     AVAILABLE SIZES  4         0.000
    AVAILABLE SHAPES  5        -0.000 PELLETS
      CRUSH STRENGTH  6         0.000
            HARDNESS  7         0.000
           PORE SIZE  8    200000.000
         PORE VOLUME  9         0.000
        SURFACE AREA 10          .158
        BULK DENSITY 11        87.000
       CRYSTALLINITY 12         0.000
    CRYSTALLITE SIZE 13         0.000
          MAJOR USES 14         0.000
          MAJOR USES 15         0.000
          VOLATILITY 16         0.000
    PARTICLE DENSITY 17       136.030
      MAX. OP. TEMP. 18         0.000
           ATTRITION 19         2.000
            COMMENTS 20        -0.000 MEDIUM POROSITY + PERMEABILITY
```

```
MATERIAL CODE CC303                                      MATERIAL CODE CC303

        CLASSIFICATION  1        -0.000 CRR, ALUM. OXIDE,FUSED (WHITE)
           COMPOSITION  2        -0.000 AL203 80.SI02 18.5, TI02 .55
      COST, 2CD ACTIVE  3         0.000 TI02 .55
       AVAILABLE SIZES  4         0.000
      AVAILABLE SHAPES  5         0.000
        CRUSH STRENGTH  6         0.000
              HARDNESS  7         0.000
             PORE SIZE  8    120000.000
           PORE VOLUME  9         0.000
          SURFACE AREA 10          .270
          BULK DENSITY 11        87.000
        CRYSTALLINITY  12         0.000
      CRYSTALLITE SIZE 13         0.000
           MAJOR USES  14         0.000
           MAJOR USES  15         0.000
           VOLATILITY  16         0.000
     PARTICLE DENSITY  17       124.800
       MAX. OP. TEMP.  18         0.000
            ATTRITION  19         7.000
             COMMENTS  20        -0.000 MED. POROSITY, TIGHT STRUCTURE

MATERIAL CODE CC304                                      MATERIAL CODE CC304

        CLASSIFICATION  1        -0.000 CRR, ALUM. OXIDE,FUSED (WHITE)
           COMPOSITION  2        -0.000 AL203 84.5,SI02 10.4,CAO .53
      COST, 2CD ACTIVE  3       940.000 CAO .53
       AVAILABLE SIZES  4         0.000
      AVAILABLE SHAPES  5         0.000
        CRUSH STRENGTH  6         0.000
              HARDNESS  7         0.000
             PORE SIZE  8     60000.000
           PORE VOLUME  9         0.000
          SURFACE AREA 10          .207
          BULK DENSITY 11        84.000
        CRYSTALLINITY  12         0.000
      CRYSTALLITE SIZE 13         0.000
           MAJOR USES  14         0.000
           MAJOR USES  15         0.000
           VOLATILITY  16         0.000
     PARTICLE DENSITY  17       136.030
       MAX. OP. TEMP.  18         0.000
            ATTRITION  19         2.000
             COMMENTS  20        -0.000 MED. POROSITY,TIGHT STRUCTURE
```

```
MATERIAL CODE CC305                                    MATERIAL CODE CC305

      CLASSIFICATION  1         -0.000 CRR, ALUMINUM OXIDE, FUSED.
         COMPOSITION  2         -0.000 AL203 72,SI02 22,TI02 1.8
    COST, 2CD ACTIVE  3          0.000 TI02 1.8
     AVAILABLE SIZES  4          0.000
    AVAILABLE SHAPES  5          0.000
      CRUSH STRENGTH  6          0.000
            HARDNESS  7          0.000
           PORE SIZE  8     250000.000
         PORE VOLUME  9          0.000
        SURFACE AREA 10           .186
        BULK DENSITY 11         96.000
       CRYSTALLINITY 12          0.000
    CRYSTALLITE SIZE 13          0.000
          MAJOR USES 14          0.000
          MAJOR USES 15          0.000
          VOLATILITY 16          0.000
    PARTICLE DENSITY 17        152.800
     MAX. OP. TEMP.  18          0.000
           ATTRITION 19           .500
            COMMENTS 20         -0.000 EXTRA-LOW POROSITY,TIGHT STRU.

MATERIAL CODE CC306                                    MATERIAL CODE CC306

      CLASSIFICATION  1         -0.000 CRR, ALUMINUM OXIDE, FUSED.
         COMPOSITION  2         -0.000 AL203 85.5,SI02 10.5,TI02 1.8
    COST, 2CD ACTIVE  3          0.000 TI02 1.8
     AVAILABLE SIZES  4          0.000
    AVAILABLE SHAPES  5          0.000
      CRUSH STRENGTH  6          0.000
            HARDNESS  7          0.000
           PORE SIZE  8     120000.000
         PORE VOLUME  9          0.000
        SURFACE AREA 10           .224
        BULK DENSITY 11         95.000
       CRYSTALLINITY 12          0.000
    CRYSTALLITE SIZE 13          0.000
          MAJOR USES 14          0.000
          MAJOR USES 15          0.000
          VOLATILITY 16          0.000
    PARTICLE DENSITY 17        147.000
     MAX. OP. TEMP.  18          0.000
           ATTRITION 19          7.000
            COMMENTS 20         -0.000 LOW POROSITY, COARSE GRANULE
```

```
MATERIAL CODE CC307                                              MATERIAL CODE CC307

        CLASSIFICATION  1       -0.000 CRR, ALUMINUM OXIDE, FUSED.
           COMPOSITION  2       -0.000 AL2O3 85,SIO2 11,TIO2 1.9
      COST, 2CD ACTIVE  3     1180.000 TIO2 1.9
       AVAILABLE SIZES  4        0.000
      AVAILABLE SHAPES  5       -0.000 GRANULES
        CRUSH STRENGTH  6        0.000
              HARDNESS  7        0.000
             PORE SIZE  8   580000.000
           PORE VOLUME  9        0.000
          SURFACE AREA 10         .106
          BULK DENSITY 11       81.000
        CRYSTALLINITY  12        0.000
      CRYSTALLITE SIZE 13        0.000
            MAJOR USES 14        0.000
            MAJOR USES 15        0.000
            VOLATILITY 16        0.000
      PARTICLE DENSITY 17      127.700
        MAX. OP. TEMP. 18        0.000
             ATTRITION 19        3.000
              COMMENTS 20       -0.000 MEDIUM POROSITY,COARSE GRANULE
```

```
MATERIAL CODE CC308                                              MATERIAL CODE CC308

        CLASSIFICATION  1       -0.000 CRR, ALUMINUM OXIDE, FUSED.
           COMPOSITION  2       -0.000 AL2O3 85.5,SIO2 10.5,TIO2 1.8
      COST, 2CD ACTIVE  3     1220.000 TIO2 1.8
       AVAILABLE SIZES  4        0.000
      AVAILABLE SHAPES  5       -0.000 GRANULES
        CRUSH STRENGTH  6        0.000
              HARDNESS  7        0.000
             PORE SIZE  8   390000.000
           PORE VOLUME  9        0.000
          SURFACE AREA 10         .107
          BULK DENSITY 11       68.000
        CRYSTALLINITY  12        0.000
      CRYSTALLITE SIZE 13        0.000
            MAJOR USES 14        0.000
            MAJOR USES 15        0.000
            VOLATILITY 16        0.000
      PARTICLE DENSITY 17      115.300
        MAX. OP. TEMP. 18        0.000
             ATTRITION 19        3.000
              COMMENTS 20       -0.000 MEDIUM POROSITY + GRANULE
```

```
MATERIAL CODE CC309                                    MATERIAL CODE CC309

      CLASSIFICATION  1       -0.000 CRR, ALUMINUM OXIDE, FUSED.
         COMPOSITION  2       -0.000 AL2O3 84,SIO2 11,TIO2 2.2
    COST, 2CD ACTIVE  3        0.000 TIO2 2.2
     AVAILABLE SIZES  4        0.000
    AVAILABLE SHAPES  5        0.000
      CRUSH STRENGTH  6        0.000
            HARDNESS  7        0.000
           PORE SIZE  8   260000.000
         PORE VOLUME  9        0.000
        SURFACE AREA 10         .091
        BULK DENSITY 11       78.000
       CRYSTALLINITY 12        0.000
    CRYSTALLITE SIZE 13        0.000
         MAJOR USES  14        0.000
         MAJOR USES  15        0.000
          VOLATILITY 16        0.000
    PARTICLE DENSITY 17      131.000
      MAX. OP. TEMP. 18        0.000
           ATTRITION 19        3.000
            COMMENTS 20       -0.000 MEDIUM POROSITY,OPEN STRUCTURE


MATERIAL CODE CC310                                    MATERIAL CODE CC310

      CLASSIFICATION  1       -0.000 CRR, ALUMINUM OXIDE, FUSED.
         COMPOSITION  2       -0.000 AL2O3 72,SIO2 22,TIO2 1.8
    COST, 2CD ACTIVE  3        0.000 TIO2 1.8
     AVAILABLE SIZES  4        0.000
    AVAILABLE SHAPES  5        0.000
      CRUSH STRENGTH  6        0.000
            HARDNESS  7        0.000
           PORE SIZE  8   300000.000
         PORE VOLUME  9        0.000
        SURFACE AREA 10         .202
        BULK DENSITY 11       82.000
       CRYSTALLINITY 12        0.000
    CRYSTALLITE SIZE 13        0.000
         MAJOR USES  14        0.000
         MAJOR USES  15        0.000
          VOLATILITY 16        0.000
    PARTICLE DENSITY 17      127.200
      MAX. OP. TEMP. 18        0.000
           ATTRITION 19         .800
            COMMENTS 20       -0.000 MED. POROSITY, TIGHT STRUCTURE
```

```
MATERIAL CODE CC313                                  MATERIAL CODE CC313

      CLASSIFICATION  1       -0.000 CRR, SILICON CARBIDE
         COMPOSITION  2       -0.000 SIC 80,SIO2 14,AL2O3 4,NA2O .7
    COST, 2CD ACTIVE  3     1100.000 NA2O 0.7
     AVAILABLE SIZES  4        0.000
    AVAILABLE SHAPES  5        0.000
      CRUSH STRENGTH  6        0.000
            HARDNESS  7        0.000
           PORE SIZE  8   150000.000
         PORE VOLUME  9        0.000
        SURFACE AREA 10         .569
        BULK DENSITY 11       51.000
      CRYSTALLINITY 12         0.000
   CRYSTALLITE SIZE 13         0.000
          MAJOR USES 14        0.000
          MAJOR USES 15        0.000
          VOLATILITY 16        0.000
    PARTICLE DENSITY 17       78.100
      MAX. OP. TEMP. 18        0.000
           ATTRITION 19        5.000
            COMMENTS 20       -0.000 HIGH POROSITY, TIGHT STRUCTURE

MATERIAL CODE CC314                                  MATERIAL CODE CC314

      CLASSIFICATION  1       -0.000 CRR, SILICON CARBIDE
         COMPOSITION  2       -0.000 SIC 80,SIO2 14,AL2O3 4,NA2O .7
    COST, 2CD ACTIVE  3     1220.000 NA2O 0.7
     AVAILABLE SIZES  4        0.000
    AVAILABLE SHAPES  5       -0.000 GRANULES
      CRUSH STRENGTH  6        0.000
            HARDNESS  7        0.000
           PORE SIZE  8   200000.000
         PORE VOLUME  9        0.000
        SURFACE AREA 10         .138
        BULK DENSITY 11       71.000
       CRYSTALLINITY 12        0.000
    CRYSTALLITE SIZE 13        0.000
          MAJOR USES 14        0.000
          MAJOR USES 15        0.000
          VOLATILITY 16        0.000
    PARTICLE DENSITY 17      116.700
      MAX. OP. TEMP. 18        0.000
           ATTRITION 19        3.000
            COMMENTS 20       -0.000 LOW POROSITY, COARSE GRANULE
```

```
MATERIAL CODE CC315                                    MATERIAL CODE CC315

     CLASSIFICATION  1        -0.000 CBR, SILICON CARBIDE
        COMPOSITION  2        -0.000 SIC 77.5,SIO2 15,AL203 5.5
   COST, 2CD ACTIVE  3         0.000 NOT GIVEN
    AVAILABLE SIZES  4         0.000
   AVAILABLE SHAPES  5         0.000
     CRUSH STRENGTH  6         0.000
           HARDNESS  7         0.000
          PORE SIZE  8    240000.000
        PORE VOLUME  9         0.000
       SURFACE AREA 10          .150
       BULK DENSITY 11        69.000
     CRYSTALLINITY 12          0.000
   CRYSTALLITE SIZE 13         0.000
        MAJOR USES 14          0.000
        MAJOR USES 15          0.000
        VOLATILITY 16          0.000
   PARTICLE DENSITY 17       113.500
     MAX. OP. TEMP. 18         0.000
          ATTRITION 19         1.200
           COMMENTS 20        -0.000 LOW POROSITY, OPEN STRUCTURE

MATERIAL CODE CC316                                    MATERIAL CODE CC316

     CLASSIFICATION  1        -0.000 CBR, SILICON CARBIDE
        COMPOSITION  2        -0.000 SIC 59,SIO2 26.5,AL203 11
   COST, 2CD ACTIVE  3         0.000 NOT GIVEN
    AVAILABLE SIZES  4         0.000
   AVAILABLE SHAPES  5         0.000
     CRUSH STRENGTH  6         0.000
           HARDNESS  7         0.000
          PORE SIZE  8    170000.000
        PORE VOLUME  9         0.000
       SURFACE AREA 10          .190
       BULK DENSITY 11        70.000
     CRYSTALLINITY 12          0.000
   CRYSTALLITE SIZE 13         0.000
        MAJOR USES 14          0.000
        MAJOR USES 15          0.000
        VOLATILITY 16          0.000
   PARTICLE DENSITY 17       126.500
     MAX. OP. TEMP. 18         0.000
          ATTRITION 19         1.000
           COMMENTS 20        -0.000 LOW POROSITY, TIGHT STRUCTURE
```

```
MATERIAL CODE CC317                                          MATERIAL CODE CC317

       CLASSIFICATION  1      -0.000 CRR, SILICON CARBIDE
          COMPOSITION  2      -0.000 SIC 78,SI02 15,AL203 4,CAO 1
     COST, 2CD ACTIVE  3    1380.000 CAO 1.
      AVAILABLE SIZES  4       0.000
     AVAILABLE SHAPES  5       0.000
       CRUSH STRENGTH  6       0.000
             HARDNESS  7       0.000
            PORE SIZE  8  500000.000
          PORE VOLUME  9       0.000
         SURFACE AREA 10        .197
         BULK DENSITY 11      67.000
       CRYSTALLINITY 12       0.000
     CRYSTALLITE SIZE 13       0.000
           MAJOR USES 14       0.000
           MAJOR USES 15       0.000
           VOLATILITY 16       0.000
     PARTICLE DENSITY 17     116.100
       MAX. OP. TEMP. 18       0.000
            ATTRITION 19       3.000
             COMMENTS 20      -0.000 MED. POROSITY,COARSE STRUCTURE


MATERIAL CODE CC318                                          MATERIAL CODE CC318

       CLASSIFICATION  1      -0.000 CRR, SILICON CARBIDE
          COMPOSITION  2      -0.000 AL203 4,SIC 78,SIO2 14,CAO 1.3
     COST, 2CD ACTIVE  3    1520.000 CAO 1.3
      AVAILABLE SIZES  4       0.000
     AVAILABLE SHAPES  5       0.000
       CRUSH STRENGTH  6       0.000
             HARDNESS  7       0.000
            PORE SIZE  8  110000.000
          PORE VOLUME  9       0.000
         SURFACE AREA 10        .248
         BULK DENSITY 11      67.000
        CRYSTALLINITY 12       0.000
     CRYSTALLITE SIZE 13       0.000
           MAJOR USES 14       0.000
           MAJOR USES 15       0.000
           VOLATILITY 16       0.000
     PARTICLE DENSITY 17     103.500
       MAX. OP. TEMP. 18       0.000
            ATTRITION 19       5.000
             COMMENTS 20      -0.000 MEDIUM POROSITY + GRANULE SIZE
```

```
MATERIAL CODE CC319                                    MATERIAL CODE CC319

     CLASSIFICATION  1       -0.000 CRR, SILICON CARBIDE
        COMPOSITION  2       -0.000 SIC 77,SIO2 16,AL2O3 6,K2O .55
    COST, 2CD ACTIVE  3        0.000 K2O 0.55
     AVAILABLE SIZES  4        0.000
    AVAILABLE SHAPES  5        0.000
     CRUSH STRENGTH  6        0.000
           HARDNESS  7        0.000
          PORE SIZE  8  2500000.000
        PORE VOLUME  9        0.000
       SURFACE AREA 10         .273
       BULK DENSITY 11       66.000
      CRYSTALLINITY 12        0.000
   CRYSTALLITE SIZE 13        0.000
         MAJOR USES 14        0.000
         MAJOR USES 15        0.000
         VOLATILITY 16        0.000
   PARTICLE DENSITY 17      102.300
     MAX. OP. TEMP. 18        0.000
          ATTRITION 19        3.000
           COMMENTS 20       -0.000 MEDIUM POROSITY,OPEN STRUCTURE

MATERIAL CODE CC320                                    MATERIAL CODE CC320

     CLASSIFICATION  1       -0.000 CRR, SILICON CARBIDE
        COMPOSITION  2       -0.000 SIC 59,SIO2 27,AL2O3 11,NA2O 1
    COST, 2CD ACTIVE  3        0.000 NA2O 1.
     AVAILABLE SIZES  4        0.000
    AVAILABLE SHAPES  5        0.000
     CRUSH STRENGTH  6        0.000
           HARDNESS  7        0.000
          PORE SIZE  8  1600000.000
        PORE VOLUME  9        0.000
       SURFACE AREA 10         .306
       BULK DENSITY 11       64.000
      CRYSTALLINITY 12        0.000
   CRYSTALLITE SIZE 13        0.000
         MAJOR USES 14        0.000
         MAJOR USES 15        0.000
         VOLATILITY 16        0.000
   PARTICLE DENSITY 17      104.100
     MAX. OP. TEMP. 18        0.000
          ATTRITION 19         .800
           COMMENTS 20       -0.000 MED. POROSITY, TIGHT STRUCTURE
```

```
MATERIAL CODE CC321                                      MATERIAL CODE CC321

      CLASSIFICATION  1       -0.000 CRR, MULLITE
         COMPOSITION  2       -0.000 AL203 67,SIO2 30,CAO .7
    COST, 2CD ACTIVE  3        0.000 NONE
     AVAILABLE SIZES  4        0.000
    AVAILABLE SHAPES  5       -0.000 GRANULES
      CRUSH STRENGTH  6        0.000
            HARDNESS  7        0.000
           PORE SIZE  8   370000.000
         PORE VOLUME  9        0.000
        SURFACE AREA 10         .172
        BULK DENSITY 11       76.000
      CRYSTALLINITY  12        0.000
    CRYSTALLITE SIZE 13        0.000
          MAJOR USES 14        0.000
          MAJOR USES 15        0.000
          VOLATILITY 16        0.000
    PARTICLE DENSITY 17      126.000
     MAX. OP. TEMP.  18        0.000
           ATTRITION 19        2.000
            COMMENTS 20       -0.000 LOW POROSITY,COARSE GRANULE


MATERIAL CODE CC322                                      MATERIAL CODE CC322

      CLASSIFICATION  1       -0.000 CRR, MULLITE
         COMPOSITION  2       -0.000 AL203 68,SIO2 29,CAO 1,BAO .49
    COST, 2CD ACTIVE  3     1060.000 NONE
     AVAILABLE SIZES  4        0.000
    AVAILABLE SHAPES  5       -0.000 GRANULES
      CRUSH STRENGTH  6        0.000
            HARDNESS  7        0.000
           PORE SIZE  8   390000.000
         PORE VOLUME  9        0.000
        SURFACE AREA 10         .188
        BULK DENSITY 11       48.000
       CRYSTALLINITY 12        0.000
    CRYSTALLITE SIZE 13        0.000
          MAJOR USES 14        0.000
          MAJOR USES 15        0.000
          VOLATILITY 16        0.000
    PARTICLE DENSITY 17      104.200
      MAX. OP. TEMP. 18        0.000
           ATTRITION 19        5.000
            COMMENTS 20       -0.000 MED. POROSITY,COARSE GRANULE
```

```
MATERIAL CODE CC323                                              MATERIAL CODE CC323

        CLASSIFICATION  1       -0.000 CRR, MULLITE
           COMPOSITION  2       -0.000 AL203 69,SIO2 30,NA20 .43
      COST, 2CD ACTIVE  3     1340.000 NONE
       AVAILABLE SIZES  4        0.000
      AVAILABLE SHAPES  5        0.000
        CRUSH STRENGTH  6        0.000
              HARDNESS  7        0.000
             PORE SIZE  8   130000.000
           PORE VOLUME  9        0.000
          SURFACE AREA 10         .164
          BULK DENSITY 11       52.000
         CRYSTALLINITY 12        0.000
      CRYSTALLITE SIZE 13        0.000
            MAJOR USES 14        0.000
            MAJOR USES 15        0.000
            VOLATILITY 16        0.000
      PARTICLE DENSITY 17      118.000
       MAX. OP. TEMP.  18        0.000
             ATTRITION 19        5.000
              COMMENTS 20       -0.000 MED. POROSITY, TIGHT STRUCTURE


MATERIAL CODE CC324                                              MATERIAL CODE CC324

        CLASSIFICATION  1       -0.000 CRR, ALUMINUM OXIDE (SINTERED)
           COMPOSITION  2       -0.000 AL203 88,SIO2 10,TIO2 .55
      COST, 2CD ACTIVE  3     1060.000 TIO2 .55
       AVAILABLE SIZES  4        0.000
      AVAILABLE SHAPES  5        0.000
        CRUSH STRENGTH  6        0.000
              HARDNESS  7        0.000
             PORE SIZE  8    70000.000
           PORE VOLUME  9        0.000
          SURFACE AREA 10         .380
          BULK DENSITY 11       63.000
         CRYSTALLINITY 12        0.000
      CRYSTALLITE SIZE 13        0.000
            MAJOR USES 14        0.000
            MAJOR USES 15        0.000
            VOLATILITY 16        0.000
      PARTICLE DENSITY 17      102.300
       MAX. OP. TEMP.  18        0.000
             ATTRITION 19         .100
              COMMENTS 20       -0.000 HIGH POROSITY, OPEN STRUCTURE
```

```
MATERIAL CODE CC325                                          MATERIAL CODE CC325

        CLASSIFICATION  1        -0.000 CRR, ALUMINUM OXIDE (SINTERED)
           COMPOSITION  2        -0.000 AL203 96,SIO2 2.4,FE203 0.64
     COST, 2CD ACTIVE   3      1080.000 FE203 .64
       AVAILABLE SIZES  4         0.000
      AVAILABLE SHAPES  5         0.000
        CRUSH STRENGTH  6         0.000
              HARDNESS  7         0.000
             PORE SIZE  8     20000.000
           PORE VOLUME  9         0.000
          SURFACE AREA 10          .737
          BULK DENSITY 11        61.000
        CRYSTALLINITY  12         0.000
      CRYSTALLITE SIZE 13         0.000
            MAJOR USES 14         0.000
            MAJOR USES 15         0.000
            VOLATILITY 16         0.000
      PARTICLE DENSITY 17        94.200
        MAX. OP. TEMP. 18         0.000
             ATTRITION 19         3.000
              COMMENTS 20        -0.000 HIGH POROSITY, TIGHT STRUCTURE


MATERIAL CODE CC326                                          MATERIAL CODE CC326

        CLASSIFICATION  1        -0.000 CRR, ALUMINUM OXIDE (SINTERED)
           COMPOSITION  2        -0.000 AL203 99.5,NA20 .45,FE203 .03
     COST, 2CD ACTIVE   3      1080.000 NA20
       AVAILABLE SIZES  4         0.000
      AVAILABLE SHAPES  5         0.000
        CRUSH STRENGTH  6         0.000
              HARDNESS  7         0.000
             PORE SIZE  8       300.000
           PORE VOLUME  9         0.000
          SURFACE AREA 10         5.640
          BULK DENSITY 11        60.000
        CRYSTALLINITY  12         0.000
      CRYSTALLITE SIZE 13         0.000
            MAJOR USES 14         0.000
            MAJOR USES 15         0.000
            VOLATILITY 16         0.000
      PARTICLE DENSITY 17       101.100
        MAX. OP. TEMP. 18         0.000
             ATTRITION 19          .700
              COMMENTS 20        -0.000 HIGH POROSITY, TIGHT STRUCTURE
```

```
MATERIAL CODE CC327                                         MATERIAL CODE CC327

       CLASSIFICATION  1       -0.000 CRR, ALUMINUM OXIDE (SINTERED)
          COMPOSITION  2       -0.000 AL203 96,SIO2 2.4, FE203 .64
     COST, 2CD ACTIVE  3        0.000 FE203 .64
      AVAILABLE SIZES  4        0.000
     AVAILABLE SHAPES  5        0.000
       CRUSH STRENGTH  6        0.000
             HARDNESS  7        0.000
            PORE SIZE  8    12000.000
          PORE VOLUME  9        0.000
         SURFACE AREA 10         .868
         BULK DENSITY 11       90.000
        CRYSTALLINITY 12        0.000
     CRYSTALLITE SIZE 13        0.000
           MAJOR USES 14        0.000
           MAJOR USES 15        0.000
           VOLATILITY 16        0.000
     PARTICLE DENSITY 17      138.500
      MAX. OP. TEMP. 18        0.000
            ATTRITION 19        3.000
             COMMENTS 20       -0.000 MED. POROSITY, TIGHT STRUCTURE


MATERIAL CODE CC328                                         MATERIAL CODE CC328

       CLASSIFICATION  1       -0.000 CRR, SILICA
          COMPOSITION  2       -0.000 SIO2 93,AL203 6,BAO .4,MGO .33
     COST, 2CD ACTIVE  3        0.000 BAO .4
      AVAILABLE SIZES  4        0.000
     AVAILABLE SHAPES  5        0.000
       CRUSH STRENGTH  6        0.000
             HARDNESS  7        0.000
            PORE SIZE  8    50000.000
          PORE VOLUME  9        0.000
         SURFACE AREA 10         .449
         BULK DENSITY 11       40.000
        CRYSTALLINITY 12        0.000
     CRYSTALLITE SIZE 13        0.000
           MAJOR USES 14        0.000
           MAJOR USES 15        0.000
           VOLATILITY 16        0.000
     PARTICLE DENSITY 17       63.650
      MAX. OP. TEMP. 18        0.000
            ATTRITION 19       16.000
             COMMENTS 20       -0.000 HIGH POROSITY, TIGHT STRUCTURE
```

```
MATERIAL CODE CC329                                        MATERIAL CODE CC329

      CLASSIFICATION  1        -0.000 CRR, SILICA
         COMPOSITION  2        -0.000 SIO2 94,NA2O 2.6,CAO 2,MGO .81
    COST, 2CD ACTIVE  3         0.000 NA2O
     AVAILABLE SIZES  4         0.000
    AVAILABLE SHAPES  5        -0.000 GRANULES
      CRUSH STRENGTH  6         0.000
            HARDNESS  7         0.000
           PORE SIZE  8    330000.000
         PORE VOLUME  9         0.000
        SURFACE AREA 10          .140
        BULK DENSITY 11        48.000
      CRYSTALLINITY  12         0.000
    CRYSTALLITE SIZE 13         0.000
          MAJOR USES 14         0.000
          MAJOR USES 15         0.000
          VOLATILITY 16         0.000
    PARTICLE DENSITY 17        89.860
     MAX. OP. TEMP.  18         0.000
           ATTRITION 19         5.000
            COMMENTS 20        -0.000 LOW POROSITY, COARSE GRANULE


MATERIAL CODE CC330                                        MATERIAL CODE CC330

      CLASSIFICATION  1        -0.000 CRR, SILICA
         COMPOSITION  2        -0.000 SIO2 95,NA2O 3.6,AL2O3 .56
    COST, 2CD ACTIVE  3         0.000 NA2O
     AVAILABLE SIZES  4         0.000
    AVAILABLE SHAPES  5        -0.000 GRANULES
      CRUSH STRENGTH  6         0.000
            HARDNESS  7         0.000
           PORE SIZE  8    300000.000
         PORE VOLUME  9         0.000
        SURFACE AREA 10          .300
        BULK DENSITY 11        44.000
      CRYSTALLINITY  12         0.000
    CRYSTALLITE SIZE 13         0.000
          MAJOR USES 14         0.000
          MAJOR USES 15         0.000
          VOLATILITY 16         0.000
    PARTICLE DENSITY 17        78.600
     MAX. OP. TEMP.  18         0.000
           ATTRITION 19         9.000
            COMMENTS 20        -0.000 MED. POROSITY, COARSE GRANULE
```

```
MATERIAL CODE CC331                                              MATERIAL CODE CC331

      CLASSIFICATION  1      -0.000 CRR, SILICA
         COMPOSITION  2      -0.000 SIO2 81,AL2O3 15,NA2O 1,K2O 1
    COST, 2CD ACTIVE  3    1100.000 NA2O 1, K2O 1
     AVAILABLE SIZES  4       0.000
    AVAILABLE SHAPES  5       0.000
      CRUSH STRENGTH  6       0.000
            HARDNESS  7       0.000
           PORE SIZE  8  110000.000
         PORE VOLUME  9       0.000
        SURFACE AREA 10        .339
        BULK DENSITY 11      60.000
       CRYSTALLINITY 12       0.000
    CRYSTALLITE SIZE 13       0.000
          MAJOR USES 14       0.000
          MAJOR USES 15       0.000
          VOLATILITY 16       0.000
    PARTICLE DENSITY 17      84.900
      MAX. OP. TEMP. 18       0.000
           ATTRITION 19       5.000
            COMMENTS 20      -0.000 MED. POROSITY, TIGHT STRUCTURE


MATERIAL CODE CC332                                              MATERIAL CODE CC332

      CLASSIFICATION  1      -0.000 CRR, SILICA
         COMPOSITION  2      -0.000 SIO2 94,NA2O 4.5,CAO .59
    COST, 2CD ACTIVE  3       0.000 NA2O
     AVAILABLE SIZES  4       0.000
    AVAILABLE SHAPES  5       0.000
      CRUSH STRENGTH  6       0.000
            HARDNESS  7       0.000
           PORE SIZE  8  150000.000
         PORE VOLUME  9       0.000
        SURFACE AREA 10        .230
        BULK DENSITY 11      54.000
       CRYSTALLINITY 12       0.000
    CRYSTALLITE SIZE 13       0.000
          MAJOR USES 14       0.000
          MAJOR USES 15       0.000
          VOLATILITY 16       0.000
    PARTICLE DENSITY 17      78.600
      MAX. OP. TEMP. 18       0.000
           ATTRITION 19       2.000
            COMMENTS 20      -0.000 MED. POROSITY, TIGHT STRUCTURE
```

```
MATERIAL CODE CC333                                     MATERIAL CODE CC333

        CLASSIFICATION  1       -0.000 CRR, SILICA
           COMPOSITION  2       -0.000 SIO2 95,CAO 4.95,AL203 .23
      COST, 2CD ACTIVE  3        0.000 CAO
       AVAILABLE SIZES  4        0.000
      AVAILABLE SHAPES  5        0.000
        CRUSH STRENGTH  6        0.000
              HARDNESS  7        0.000
             PORE SIZE  8    25000.000
           PORE VOLUME  9        0.000
          SURFACE AREA 10         .644
          BULK DENSITY 11       52.000
        CRYSTALLINITY 12         0.000
      CRYSTALLITE SIZE 13        0.000
           MAJOR USES 14         0.000
           MAJOR USES 15         0.000
           VOLATILITY 16         0.000
      PARTICLE DENSITY 17       88.600
       MAX. OP. TEMP. 18         0.000
            ATTRITION 19         9.000
             COMMENTS 20        -0.000 MED. POROSITY, TIGHT STRUCTURE


MATERIAL CODE CC334                                     MATERIAL CODE CC334

        CLASSIFICATION  1       -0.000 CRR, ZIRCON
           COMPOSITION  2       -0.000 ZRO2 60,SIO2 36,AL203 2,CAO .9
      COST, 2CD ACTIVE  3        0.000 CAO .9
       AVAILABLE SIZES  4        0.000
      AVAILABLE SHAPES  5       -0.000 GRANULES
        CRUSH STRENGTH  6        0.000
              HARDNESS  7        0.000
             PORE SIZE  8   440000.000
           PORE VOLUME  9        0.000
          SURFACE AREA 10         .090
          BULK DENSITY 11       96.000
        CRYSTALLINITY 12         0.000
      CRYSTALLITE SIZE 13        0.000
           MAJOR USES 14         0.000
           MAJOR USES 15         0.000
           VOLATILITY 16         0.000
      PARTICLE DENSITY 17      173.700
       MAX. OP. TEMP. 18         0.000
            ATTRITION 19        13.000
             COMMENTS 20        -0.000 LOW POROSITY, COARSE GRANULE
```

```
MATERIAL CODE CC335                                        MATERIAL CODE CC335

        CLASSIFICATION  1       -0.000 CRR, ZIRCON
           COMPOSITION  2       -0.000 ZRO2 54,SIO2 38,AL2O3 7,CAO .6
      COST, 2CD ACTIVE  3        0.000 CAO .6
       AVAILABLE SIZES  4        0.000
      AVAILABLE SHAPES  5        0.000
        CRUSH STRENGTH  6        0.000
              HARDNESS  7        0.000
             PORE SIZE  8    60000.000
           PORE VOLUME  9        0.000
          SURFACE AREA 10         .310
          BULK DENSITY 11       98.000
         CRYSTALLINITY 12        0.000
      CRYSTALLITE SIZE 13        0.000
           MAJOR USES  14        0.000
           MAJOR USES  15        0.000
            VOLATILITY 16        0.000
      PARTICLE DENSITY 17      154.900
        MAX. OP. TEMP. 18        0.000
             ATTRITION 19         .200
              COMMENTS 20       -0.000 LOW POROSITY, TIGHT STRUCTURE


MATERIAL CODE CC336                                        MATERIAL CODE CC336

        CLASSIFICATION  1       -0.000 CRR, ZIRCONIA
           COMPOSITION  2       -0.000 ZRO2 93,CAO 5,SIO2 .6,AL2O3 .5
      COST, 2CD ACTIVE  3        0.000 CAO
       AVAILABLE SIZES  4        0.000
      AVAILABLE SHAPES  5        0.000
        CRUSH STRENGTH  6        0.000
              HARDNESS  7        0.000
             PORE SIZE  8   120000.000
           PORE VOLUME  9        0.000
          SURFACE AREA 10         .163
          BULK DENSITY 11      121.000
         CRYSTALLINITY 12        0.000
      CRYSTALLITE SIZE 13        0.000
           MAJOR USES  14        0.000
           MAJOR USES  15        0.000
            VOLATILITY 16        0.000
      PARTICLE DENSITY 17      193.000
        MAX. OP. TEMP. 18        0.000
             ATTRITION 19        3.000
              COMMENTS 20       -0.000 MED. POROSITY, TIGHT STRUCTURE
```

```
MATERIAL CODE CC337                                          MATERIAL CODE CC337

      CLASSIFICATION  1      -0.000 CRR, ALUMINUM OXIDE (SINTERED)
         COMPOSITION  2      -0.000 AL203 96,SI02 2.4,FE203 .64
     COST, 2CD ACTIVE  3    1220.000 FE203 .64
     AVAILABLE SIZES  4       0.000
    AVAILABLE SHAPES  5       0.000
      CRUSH STRENGTH  6       0.000
            HARDNESS  7       0.000
           PORE SIZE  8       0.000
         PORE VOLUME  9        .180
        SURFACE AREA 10        .577
        BULK DENSITY 11      76.000
       CRYSTALLINITY 12       0.000
    CRYSTALLITE SIZE 13       0.000
          MAJOR USES 14       0.000
          MAJOR USES 15       0.000
          VOLATILITY 16       0.000
    PARTICLE DENSITY 17      66.800
     MAX. OP. TEMP.  18       0.000
           ATTRITION 19       0.000
            COMMENTS 20      -0.000 EXTRA-HIGH POROSITY,FINE PORE

MATERIAL CODE CC338                                          MATERIAL CODE CC338

      CLASSIFICATION  1      -0.000 CRR, ALUMINUM OXIDE (SINTERED)
         COMPOSITION  2      -0.000 AL203 96,SI02 2.4,FE203 .64
     COST, 2CD ACTIVE  3       0.000 FE203 .64
     AVAILABLE SIZES  4       0.000
    AVAILABLE SHAPES  5       0.000
      CRUSH STRENGTH  6       0.000
            HARDNESS  7       0.000
           PORE SIZE  8       0.000
         PORE VOLUME  9        .140
        SURFACE AREA 10        .340
        BULK DENSITY 11      80.000
       CRYSTALLINITY 12       0.000
    CRYSTALLITE SIZE 13       0.000
          MAJOR USES 14       0.000
          MAJOR USES 15       0.000
          VOLATILITY 16       0.000
    PARTICLE DENSITY 17      73.100
     MAX. OP. TEMP.  18       0.000
           ATTRITION 19       0.000
            COMMENTS 20      -0.000 EXTRA-HIGH POROSITY, FINE PORE
```

```
MATERIAL CODE CC339                                          MATERIAL CODE CC339

         CLASSIFICATION  1      -0.000 CRR, ALUMINUM OXIDE (SINTERED)
            COMPOSITION  2      -0.000 AL203 96,SIO2 1.3,CAO 1.2
        COST, 2CD ACTIVE  3       0.000 CAO 1.2
         AVAILABLE SIZES  4       0.000
        AVAILABLE SHAPES  5       0.000
          CRUSH STRENGTH  6       0.000
                HARDNESS  7       0.000
               PORE SIZE  8       0.000
             PORE VOLUME  9        .230
            SURFACE AREA 10       2.300
            BULK DENSITY 11      74.000
           CRYSTALLINITY 12       0.000
        CRYSTALLITE SIZE 13       0.000
              MAJOR USES 14       0.000
              MAJOR USES 15       0.000
              VOLATILITY 16       0.000
        PARTICLE DENSITY 17      74.900
          MAX. OP. TEMP. 18       0.000
               ATTRITION 19       0.000
                COMMENTS 20      -0.000 EXTRA-HIGH POROSITY, FINE PORE


MATERIAL CODE CC340                                          MATERIAL CODE CC340

         CLASSIFICATION  1      -0.000 CRR, ALUMINUM OXIDE (SINTERED)
            COMPOSITION  2      -0.000 AL203 99,NA20 .5,FE203 .04
        COST, 2CD ACTIVE  3       0.000 NA20 .5
         AVAILABLE SIZES  4       0.000
        AVAILABLE SHAPES  5       0.000
          CRUSH STRENGTH  6       0.000
                HARDNESS  7       0.000
               PORE SIZE  8       0.000
             PORE VOLUME  9        .300
            SURFACE AREA 10       4.690
            BULK DENSITY 11      75.000
           CRYSTALLINITY 12       0.000
        CRYSTALLITE SIZE 13       0.000
              MAJOR USES 14       0.000
              MAJOR USES 15       0.000
              VOLATILITY 16       0.000
        PARTICLE DENSITY 17      71.200
          MAX. OP. TEMP. 18       0.000
               ATTRITION 19       0.000
                COMMENTS 20      -0.000 EXTRA-HIGH POROSITY, FINE PORE
```

```
MATERIAL CODE CC341                                          MATERIAL CODE CC341

        CLASSIFICATION  1       -0.000 CRR, ALUMINUM OXIDE (SINTERED)
           COMPOSITION  2       -0.000 AL203 82,SIO2 9.5,MGO 3,BAO 2
      COST, 2CD ACTIVE  3        0.000 MGO 3.
       AVAILABLE SIZES  4        0.000
      AVAILABLE SHAPES  5        0.000
        CRUSH STRENGTH  6        0.000
              HARDNESS  7        0.000
             PORE SIZE  8        0.000
           PORE VOLUME  9         .140
          SURFACE AREA 10         .555
          BULK DENSITY 11       84.000
         CRYSTALLINITY 12        0.000
      CRYSTALLITE SIZE 13        0.000
            MAJOR USES 14        0.000
            MAJOR USES 15        0.000
            VOLATILITY 16        0.000
      PARTICLE DENSITY 17       69.950
        MAX. OP. TEMP. 18        0.000
             ATTRITION 19        0.000
              COMMENTS 20       -0.000 EXTRA-HIGH POROSITY, FINE PORE


MATERIAL CODE CC342                                          MATERIAL CODE CC342

        CLASSIFICATION  1       -0.000 CRR, ALUMINUM OXIDE (SINTERED)
           COMPOSITION  2       -0.000 AL203 99.8,SIO2 .08,FE203 .04
      COST, 2CD ACTIVE  3        0.000 NONE
       AVAILABLE SIZES  4        0.000
      AVAILABLE SHAPES  5        0.000
        CRUSH STRENGTH  6        0.000
              HARDNESS  7        0.000
             PORE SIZE  8        0.000
           PORE VOLUME  9         .220
          SURFACE AREA 10        1.400
          BULK DENSITY 11       75.000
         CRYSTALLINITY 12        0.000
      CRYSTALLITE SIZE 13        0.000
            MAJOR USES 14        0.000
            MAJOR USES 15        0.000
            VOLATILITY 16        0.000
      PARTICLE DENSITY 17       80.000
        MAX. OP. TEMP. 18        0.000
             ATTRITION 19        0.000
              COMMENTS 20       -0.000 EXTRA-HIGH POROSITY, FINE PORE
```

```
MATERIAL CODE CY101                                        MATERIAL CODE CY101

       CLASSIFICATION  1       -0.000 CAT, MOLECULAR SIEVE
          COMPOSITION  2       -0.000 SIO2 86,AL203 14, FE .05
     COST, 2CD ACTIVE  3      370.000 FE .05
      AVAILABLE SIZES  4       -0.000 150 MICRONS  MAX.
     AVAILABLE SHAPES  5       -0.000 POWDER
       CRUSH STRENGTH  6        0.000
             HARDNESS  7        0.000
            PORE SIZE  8        0.000
          PORE VOLUME  9         .720 MINIMUM;  .78 MAXIMUM
         SURFACE AREA 10      500.000 MINIMUM;  650 MAXIMUM
         BULK DENSITY 11       27.000 MINIMUM, 35 MAXIMUM
        CRYSTALLINITY 12        0.000
     CRYSTALLITE SIZE 13        0.000
           MAJOR USES 14        0.000 CRACKING
           MAJOR USES 15        0.000
           VOLATILITY 16       16.000
     PARTICLE DENSITY 17        0.000
       MAX. OP. TEMP. 18        0.000
            ATTRITION 19        0.000
             COMMENTS 20        0.000


MATERIAL CODE CY102                                        MATERIAL CODE CY102

       CLASSIFICATION  1       -0.000 CAT, MOLECULAR SIEVE
          COMPOSITION  2       -0.000 SIO2 74,AL203 26,FE .05
     COST, 2CD ACTIVE  3      370.000 FE .05
      AVAILABLE SIZES  4        0.000
     AVAILABLE SHAPES  5        0.000
       CRUSH STRENGTH  6        0.000
             HARDNESS  7        0.000
            PORE SIZE  8        0.000
          PORE VOLUME  9         .840 MINIMUM; .92 MAXIMUM
         SURFACE AREA 10      450.000 MINIMUM; 600 MAXIMUM
         BULK DENSITY 11       24.000 MINIMUM, 30 MAX.
        CRYSTALLINITY 12        0.000
     CRYSTALLITE SIZE 13        0.000
           MAJOR USES 14        0.000 CRACKING
           MAJOR USES 15        0.000
           VOLATILITY 16       19.000
     PARTICLE DENSITY 17        0.000
       MAX. OP. TEMP. 18        0.000
            ATTRITION 19        0.000
             COMMENTS 20        0.000
```

```
MATERIAL CODE CY103                                            MATERIAL CODE CY103

      CLASSIFICATION  1      -0.000 CAT, MOLECULAR SIEVE
         COMPOSITION  2       0.000 SIO2 74.4%; AL2O3 25%; FE .04%
    COST, 2CD ACTIVE  3     370.000 FE .04
     AVAILABLE SIZES  4       0.000 60 MICRONS
    AVAILABLE SHAPES  5      -0.000 POWDER
      CRUSH STRENGTH  6       0.000
            HARDNESS  7       0.000
           PORE SIZE  8       0.000
         PORE VOLUME  9        .890
        SURFACE AREA 10       0.000
        BULK DENSITY 11      27.000
       CRYSTALLINITY 12       0.000
    CRYSTALLITE SIZE 13       0.000
          MAJOR USES 14       0.000 CRACKING
          MAJOR USES 15       0.000
          VOLATILITY 16      13.000
    PARTICLE DENSITY 17       0.000
      MAX. OP. TEMP. 18       0.000
           ATTRITION 19      16.000 PER CENT, 1 HOUR
            COMMENTS 20       0.000


MATERIAL CODE CY104                                            MATERIAL CODE CY104

      CLASSIFICATION  1      -0.000 CAT, MOLECULAR SIEVE
         COMPOSITION  2      -0.000 SIO2 66, AL2O3 34, FE .12
    COST, 2CD ACTIVE  3     370.000 FE .12
     AVAILABLE SIZES  4       0.000 63 MICRONS
    AVAILABLE SHAPES  5      -0.000 POWDER
      CRUSH STRENGTH  6       0.000
            HARDNESS  7       0.000
           PORE SIZE  8       0.000
         PORE VOLUME  9        .570
        SURFACE AREA 10     330.000
        BULK DENSITY 11      33.000
       CRYSTALLINITY 12       0.000
    CRYSTALLITE SIZE 13       0.000
          MAJOR USES 14       0.000 CRACKING
          MAJOR USES 15       0.000
          VOLATILITY 16      12.500
    PARTICLE DENSITY 17       0.000
      MAX. OP. TEMP. 18       0.000
           ATTRITION 19      12.000 PER CENT, 1 HOUR
            COMMENTS 20       0.000
```

```
MATERIAL CODE CY105                                                MATERIAL CODE CY105

         CLASSIFICATION  1       -0.000 CAT, MOLECULAR SIEVE
            COMPOSITION  2       -0.000 AL203 14%, FE .05%, NA20 .02%
      COST, 2CD ACTIVE   3      370.000 FE .05
        AVAILABLE SIZES  4        0.000
       AVAILABLE SHAPES  5        0.000
         CRUSH STRENGTH  6        0.000
               HARDNESS  7        0.000
              PORE SIZE  8        0.000
            PORE VOLUME  9         .720
           SURFACE AREA 10      500.000
           BULK DENSITY 11       27.500
          CRYSTALLINITY 12        0.000
       CRYSTALLITE SIZE 13        0.000
             MAJOR USES 14       -0.000 FLUID CRACKING
             MAJOR USES 15        0.000
             VOLATILITY 16       16.000
       PARTICLE DENSITY 17        0.000
        MAX. OP. TEMP.  18        0.000
              ATTRITION 19        0.000
               COMMENTS 20        0.000


MATERIAL CODE CY201                                                MATERIAL CODE CY201

         CLASSIFICATION  1       -0.000 CAT, MOLECULAR SIEVE
            COMPOSITION  2       -0.000 SIO2 85, AL203 15, SO4 .3
      COST, 2CD ACTIVE   3      370.000 NONE
        AVAILABLE SIZES  4       -0.000 63 MICRONS
       AVAILABLE SHAPES  5        0.000
         CRUSH STRENGTH  6        0.000
               HARDNESS  7        0.000
              PORE SIZE  8        0.000
            PORE VOLUME  9         .600
           SURFACE AREA 10      575.000
           BULK DENSITY 11       32.000
          CRYSTALLINITY 12        0.000
       CRYSTALLITE SIZE 13        0.000
             MAJOR USES 14        0.000 CRACKING
             MAJOR USES 15        0.000
             VOLATILITY 16       12.000
       PARTICLE DENSITY 17        0.000
        MAX. OP. TEMP.  18        0.000
              ATTRITION 19       14.000 PER CENT, 1 HOUR
               COMMENTS 20       -0.000 SUR. AREA DEC. BY STEAM 1070F
```

```
MATERIAL CODE CY302                                      MATERIAL CODE CY302

       CLASSIFICATION  1       -0.000 CAT, NI-MO
          COMPOSITION  2        0.000 MO(O)3 15%; NIO 3.1%;
     COST, 2CD ACTIVE  3     1900.000 NIO 3.1%
      AVAILABLE SIZES  4        0.000 1/16 TO 1/8 INCH DIAM.
     AVAILABLE SHAPES  5        0.000
       CRUSH STRENGTH  6        0.000
             HARDNESS  7        0.000
            PORE SIZE  8        0.000
          PORE VOLUME  9         .600
         SURFACE AREA 10      200.000
         BULK DENSITY 11       35.000
        CRYSTALLINITY 12        0.000
     CRYSTALLITE SIZE 13        0.000
           MAJOR USES 14        0.000 HYDROGENATION; DESULFURIZATION
           MAJOR USES 15        0.000
           VOLATILITY 16        0.000
     PARTICLE DENSITY 17        0.000
       MAX. OP. TEMP. 18      700.000
            ATTRITION 19        0.000
             COMMENTS 20       -0.000 SUBSTRATE NOT SPECIFIED


MATERIAL CODE CY401                                      MATERIAL CODE CY401

       CLASSIFICATION  1       -0.000 CAT, PLATINUM
          COMPOSITION  2        0.000 PT-AS SPECIFIED; FE .025%
     COST, 2CD ACTIVE  3        0.000 FE .025%
      AVAILABLE SIZES  4        0.000 1/16 INCH DIAM.
     AVAILABLE SHAPES  5       -0.000 EXTRUSIONS
       CRUSH STRENGTH  6       10.000
             HARDNESS  7        0.000
            PORE SIZE  8        0.000
          PORE VOLUME  9        0.000
         SURFACE AREA 10        0.000
         BULK DENSITY 11       35.000 POURED
        CRYSTALLINITY 12        0.000
     CRYSTALLITE SIZE 13        0.000
           MAJOR USES 14        0.000 REFORMING NAPHTHAS
           MAJOR USES 15        0.000
           VOLATILITY 16        3.500 2300F
     PARTICLE DENSITY 17        0.000
       MAX. OP. TEMP. 18        0.000
            ATTRITION 19        0.000
             COMMENTS 20       -0.000 COST DEPENDS ON PT CONTENT
```

```
MATERIAL CODE CY501                                                MATERIAL CODE CY501

      CLASSIFICATION  1      -0.000 CAT, VANADIA-SILICA
         COMPOSITION  2      -0.000 V205 6.1, K20 10.8, SIO2 62.
    COST, 2CD ACTIVE  3     370.000 K20 10.8%
     AVAILABLE SIZES  4      -0.000 95 PER CENT FINER THAN 149 MU.
    AVAILABLE SHAPES  5       0.000
      CRUSH STRENGTH  6       0.000
            HARDNESS  7       0.000
           PORE SIZE  8       0.000
         PORE VOLUME  9       0.000
        SURFACE AREA 10     220.000
        BULK DENSITY 11      34.000
      CRYSTALLINITY  12       0.000
    CRYSTALLITE SIZE 13       0.000
          MAJOR USES 14       0.000 MFG OF PHTHALIC ANHYDRIDE
          MAJOR USES 15       0.000
          VOLATILITY 16       0.000
    PARTICLE DENSITY 17       0.000
      MAX. OP. TEMP. 18       0.000
           ATTRITION 19       0.000
            COMMENTS 20       0.000

MATERIAL CODE CY601                                                MATERIAL CODE CY601

      CLASSIFICATION  1      -0.000 CAT, VANADIA, SULFURIC ACID
         COMPOSITION  2       0.000 V205 9.1%, K20 10.1%; FE .45%
    COST, 2CD ACTIVE  3     370.000 K20 10.1%
     AVAILABLE SIZES  4       0.000 5/16X1/4 INCH
    AVAILABLE SHAPES  5       0.000 PELLETS
      CRUSH STRENGTH  6      45.000 AVERAGE OF 25 PELLETS
            HARDNESS  7       0.000
           PORE SIZE  8       0.000
         PORE VOLUME  9       0.000
        SURFACE AREA 10       0.000
        BULK DENSITY 11      36.000
      CRYSTALLINITY  12       0.000
    CRYSTALLITE SIZE 13       0.000
          MAJOR USES 14       0.000 CONTACT SULFURIC ACID PROCESS
          MAJOR USES 15       0.000
          VOLATILITY 16       9.400 1470F
    PARTICLE DENSITY 17       0.000
      MAX. OP. TEMP. 18       0.000
           ATTRITION 19       0.000
            COMMENTS 20      -0.000 SUBSTRATE NOT SPECIFIED
```

```
MATERIAL CODE CY701                                         MATERIAL CODE CY701

       CLASSIFICATION  1        -0.000 CAT, COBALT-MOLYBDENA CATALYST
          COMPOSITION  2        -0.000 MOO3 15.7, COO 3.2, NA2O .02
     COST, 2CD ACTIVE  3      1900.000 COO3 3.2
      AVAILABLE SIZES  4        -0.000 .248 IN. LENGTH, .134 IN. DIA.
     AVAILABLE SHAPES  5         0.000
       CRUSH STRENGTH  6        18.400
             HARDNESS  7         0.000
            PORE SIZE  8         0.000
          PORE VOLUME  9          .540
         SURFACE AREA 10       258.000
         BULK DENSITY 11        32.600
       CRYSTALLINITY  12         0.000
     CRYSTALLITE SIZE 13         0.000
           MAJOR USES 14        -0.000 DESULFURIZATION, HYDROGENATION
           MAJOR USES 15        -0.000 REDUCES S2 AND N2 IN PETROLEUM
           VOLATILITY 16         1.500
     PARTICLE DENSITY 17         0.000
       MAX. OP. TEMP. 18      1000.000
            ATTRITION 19         0.000
             COMMENTS 20         0.000

MATERIAL CODE CY702                                         MATERIAL CODE CY702

       CLASSIFICATION  1        -0.000 CAT, COBALT-MOLYBDENA CATALYST
          COMPOSITION  2        -0.000 MOO3 15.7, COO 3.0, NA2O .02
     COST, 2CD ACTIVE  3      1900.000 COO3 3.0
      AVAILABLE SIZES  4        -0.000 .189 IN. LENGTH, .069 IN. DIA.
     AVAILABLE SHAPES  5         0.000
       CRUSH STRENGTH  6        14.200
             HARDNESS  7         0.000
            PORE SIZE  8         0.000
          PORE VOLUME  9          .540
         SURFACE AREA 10       255.000
         BULK DENSITY 11        32.600
       CRYSTALLINITY  12         0.000
     CRYSTALLITE SIZE 13         0.000
           MAJOR USES 14        -0.000 DESULFURIZATION, HYDROGENATION
           MAJOR USES 15        -0.000 REDUCES S2 AND N2 IN PETROLEUM
           VOLATILITY 16         1.400
     PARTICLE DENSITY 17         0.000
       MAX. OP. TEMP. 18      1000.000
            ATTRITION 19         0.000
             COMMENTS 20         0.000
```

```
MATERIAL CODE DG101                                        MATERIAL CODE DG101

      CLASSIFICATION  1     -0.000 SOR, SILICA GEL
         COMPOSITION  2      0.000 SIO2 99.71%
    COST, 2CD ACTIVE  3   1240.000 NONE
     AVAILABLE SIZES  4      0.000 3 TO 8 (TYLER SIEVE)
    AVAILABLE SHAPES  5      0.000 IRREGULAR GRANULES
      CRUSH STRENGTH  6      0.000
            HARDNESS  7      0.000
           PORE SIZE  8      0.000
         PORE VOLUME  9       .430
       SURFACE AREA  10    800.000
       BULK DENSITY  11     46.000
     CRYSTALLINITY   12      0.000
   CRYSTALLITE SIZE  13      0.000
         MAJOR USES  14      0.000 AIR AND GAS DRYING
         MAJOR USES  15      0.000
         VOLATILITY  16      5.500    1750 DEG F
   PARTICLE DENSITY  17      0.000
     MAX. OP. TEMP.  18      0.000
          ATTRITION  19      0.000
           COMMENTS  20      0.000

MATERIAL CODE DG102                                        MATERIAL CODE DG102

      CLASSIFICATION  1     -0.000 SOR, SILICA GEL
         COMPOSITION  2     -0.000 SIO2 99.7, AL2O3 .10, TIO2 .09
    COST, 2CD ACTIVE  3    620.000 NONE
     AVAILABLE SIZES  4     -0.000 3 TO 8 (TYLER SIEVE)
    AVAILABLE SHAPES  5     -0.000 GRANULAR
      CRUSH STRENGTH  6      0.000
            HARDNESS  7      0.000
           PORE SIZE  8      0.000
         PORE VOLUME  9       .430
       SURFACE AREA  10    800.000
       BULK DENSITY  11     45.000
      CRYSTALLINITY  12      0.000
   CRYSTALLITE SIZE  13      0.000
         MAJOR USES  14     -0.000 AIR AND GAS DRYING
         MAJOR USES  15     -0.000 POSSIBLE CATALYST OR CARRIER
         VOLATILITY  16      6.000 AT 1750 F
   PARTICLE DENSITY  17      0.000
     MAX. OP. TEMP.  18      0.000
          ATTRITION  19      0.000
           COMMENTS  20     -0.000 ALSO USED IN LIQUIDS
```

```
MATERIAL CODE DG103                                          MATERIAL CODE DG103

         CLASSIFICATION  1      -0.000 SOR, SILICA GEL
            COMPOSITION  2      -0.000 SIO2 99.7, AL2O3 .10, TIO2 .09
        COST, 2CD ACTIVE  3    1380.000 NONE
         AVAILABLE SIZES  4      -0.000 8 TO 14 (TYLER SIEVE)
        AVAILABLE SHAPES  5      -0.000 GRANULAR
          CRUSH STRENGTH  6       0.000
                HARDNESS  7       0.000
               PORE SIZE  8       0.000
             PORE VOLUME  9        .400
            SURFACE AREA 10     750.000
            BULK DENSITY 11      45.000
          CRYSTALLINITY 12       0.000
       CRYSTALLITE SIZE 13       0.000
             MAJOR USES 14      -0.000 AIR AND GAS DRYING
             MAJOR USES 15      -0.000 POSSIBLE CATALYST OR CARRIER
             VOLATILITY 16       5.500 AT 1750 F
       PARTICLE DENSITY 17       0.000
        MAX. OP. TEMP. 18       0.000
              ATTRITION 19       0.000
               COMMENTS 20      -0.000 ALSO USED IN LIQUIDS


MATERIAL CODE DG104                                          MATERIAL CODE DG104

         CLASSIFICATION  1      -0.000 SOR,SILICA GEL
            COMPOSITION  2      -0.000 SIO2 99.7, AL2O3 .10, TIO2 .09
        COST, 2CD ACTIVE  3    1100.000 NONE
         AVAILABLE SIZES  4      -0.000 6 TO 16 (TYLER SIEVE)
        AVAILABLE SHAPES  5      -0.000 GRANULAR
          CRUSH STRENGTH  6       0.000
                HARDNESS  7       0.000
               PORE SIZE  8       0.000
             PORE VOLUME  9        .430
            SURFACE AREA 10     800.000
            BULK DENSITY 11      46.000
          CRYSTALLINITY 12       0.000
       CRYSTALLITE SIZE 13       0.000
             MAJOR USES 14      -0.000 AIR AND GAS DRYING
             MAJOR USES 15      -0.000 POSSIBLE CATALYST OR CARRIER
             VOLATILITY 16       5.500 AT 1750 F
       PARTICLE DENSITY 17       0.000
        MAX. OP. TEMP. 18       0.000
              ATTRITION 19       0.000
               COMMENTS 20      -0.000 VERY LIMITED USES IN LIQUIDS
```

```
MATERIAL CODE DG105                                          MATERIAL CODE DG105

        CLASSIFICATION  1       -0.000 SOR, SILICA GEL
           COMPOSITION  2       -0.000 SIO2 99.7, AL2O3 .10, TIO2 .09
      COST, 2CD ACTIVE  3        0.000 NONE
       AVAILABLE SIZES  4       -0.000 8 TO 20 (TYLER SIEVE)
      AVAILABLE SHAPES  5       -0.000 GRANULAR
        CRUSH STRENGTH  6        0.000
              HARDNESS  7        0.000
             PORE SIZE  8        0.000
           PORE VOLUME  9         .380
          SURFACE AREA 10      600.000
          BULK DENSITY 11       46.000
         CRYSTALLINITY 12        0.000
      CRYSTALLITE SIZE 13        0.000
            MAJOR USES 14       -0.000 AIR AND GAS DRYING
            MAJOR USES 15       -0.000 USED AS CAT IN LIQ PROCESSES
            VOLATILITY 16        4.400 AT 1750 F
      PARTICLE DENSITY 17        0.000
        MAX. OP. TEMP. 18        0.000
             ATTRITION 19        0.000
              COMMENTS 20        0.000


MATERIAL CODE DG106                                          MATERIAL CODE DG106

        CLASSIFICATION  1       -0.000 SOR, SILICA GEL
           COMPOSITION  2       -0.000 SIO2 99.7, AL2O3 .10, TIO2 .09
      COST, 2CD ACTIVE  3        0.000 NONE
       AVAILABLE SIZES  4       -0.000 12 TO 28 (TYLER SIEVE)
      AVAILABLE SHAPES  5       -0.000 GRANULAR
        CRUSH STRENGTH  6        0.000
              HARDNESS  7        0.000
             PORE SIZE  8        0.000
           PORE VOLUME  9         .400
          SURFACE AREA 10      750.000
          BULK DENSITY 11       46.000
         CRYSTALLINITY 12        0.000
      CRYSTALLITE SIZE 13        0.000
            MAJOR USES 14       -0.000 AIR AND GAS DRYING
            MAJOR USES 15       -0.000 WIDELY USED AS SOR WITH LIQS
            VOLATILITY 16        5.500 AT 1750 F
      PARTICLE DENSITY 17        0.000
        MAX. OP. TEMP. 18        0.000
             ATTRITION 19        0.000
              COMMENTS 20       -0.000 SOME USE AS CAT IN LIQ PROCESS
```

```
MATERIAL CODE DG107                                         MATERIAL CODE DG107

      CLASSIFICATION  1        -0.000 SOR, SILICA GEL
         COMPOSITION  2        -0.000 SIO2 99.7, AL2O3 .10, TIO2 .09
    COST, 2CD ACTIVE  3       820.000 NONE
     AVAILABLE SIZES  4        -0.000 6 TO 12 (TYLER SIEVE)
    AVAILABLE SHAPES  5        -0.000 GRANULAR
      CRUSH STRENGTH  6         0.000
            HARDNESS  7         0.000
           PORE SIZE  8         0.000
         PORE VOLUME  9          .430
        SURFACE AREA 10       800.000
        BULK DENSITY 11        45.000
       CRYSTALLINITY 12         0.000
    CRYSTALLITE SIZE 13         0.000
          MAJOR USES 14        -0.000 AIR AND GAS DRYING
          MAJOR USES 15        -0.000 LIMITED USE WITH LIQUIDS
          VOLATILITY 16         5.500 AT 1750 F
    PARTICLE DENSITY 17         0.000
      MAX. OP. TEMP. 18         0.000
           ATTRITION 19         0.000
            COMMENTS 20        -0.000 POSSIBLE USE AS CATALYST


MATERIAL CODE DG108                                         MATERIAL CODE DG108

      CLASSIFICATION  1        -0.000 SOR, SILICA GEL
         COMPOSITION  2        -0.000 SIO2 99.7, AL2O3 .10, TIO2 .09
    COST, 2CD ACTIVE  3       640.000 NONE
     AVAILABLE SIZES  4        -0.000 3 TO 9 (TYLER SIEVE)
    AVAILABLE SHAPES  5        -0.000 GRANULAR
      CRUSH STRENGTH  6         0.000
            HARDNESS  7         0.000
           PORE SIZE  8         0.000
         PORE VOLUME  9          .430
        SURFACE AREA 10       750.000
        BULK DENSITY 11        45.000
       CRYSTALLINITY 12         0.000
    CRYSTALLITE SIZE 13         0.000
          MAJOR USES 14        -0.000 AIR AND GAS DRYING
          MAJOR USES 15        -0.000 POSSIBLE CATALYST OR CARRIER
          VOLATILITY 16         5.500 AT 1750 F
    PARTICLE DENSITY 17         0.000
      MAX. OP. TEMP. 18         0.000
           ATTRITION 19         0.000
            COMMENTS 20         0.000
```

```
MATERIAL CODE DG109                                    MATERIAL CODE DG109

        CLASSIFICATION  1      -0.000 SOR, SILICA GEL
           COMPOSITION  2      -0.000 SIO2 99.7, AL2O3 .10, TIO2 .09
     COST, 2CD ACTIVE   3    1100.000 NONE
       AVAILABLE SIZES  4      -0.000 28 TO 200 (TYLER SIEVE)
      AVAILABLE SHAPES  5      -0.000 GRANULAR
        CRUSH STRENGTH  6       0.000
              HARDNESS  7       0.000
             PORE SIZE  8       0.000
           PORE VOLUME  9        .430
          SURFACE AREA 10     800.000
          BULK DENSITY 11      46.000
         CRYSTALLINITY 12       0.000
      CRYSTALLITE SIZE 13       0.000
           MAJOR USES  14      -0.000 SELECTIVE ADSORPTION- USED FOR
           MAJOR USES  15      -0.000 LIQUID OR GAS PHASE SEPARATION
            VOLATILITY 16       6.000 AT 1750 F
      PARTICLE DENSITY 17       0.000
       MAX. OP. TEMP.  18       0.000
             ATTRITION 19       0.000
              COMMENTS 20       0.000

MATERIAL CODE DG110                                    MATERIAL CODE DG110

        CLASSIFICATION  1      -0.000 SOR, SILICA GEL
           COMPOSITION  2      -0.000 SIO2 99.7, AL2O3 .10, TIO2 .09
      COST, 2CD ACTIVE  3    4800.000 NONE
       AVAILABLE SIZES  4      -0.000 20 TO 65 (TYLER SIEVE)
      AVAILABLE SHAPES  5      -0.000 GRANULAR
        CRUSH STRENGTH  6       0.000
              HARDNESS  7       0.000
             PORE SIZE  8       0.000
           PORE VOLUME  9        .430
          SURFACE AREA 10     800.000
          BULK DENSITY 11      26.000
         CRYSTALLINITY 12       0.000
      CRYSTALLITE SIZE 13       0.000
           MAJOR USES  14      -0.000 SELECTIVE ADSORPTION- USED FOR
           MAJOR USES  15      -0.000 LIQUID OR GAS PHASE SEPARATION
            VOLATILITY 16       6.000 AT 1750 F
      PARTICLE DENSITY 17       0.000
       MAX. OP. TEMP.  18       0.000
             ATTRITION 19       0.000
              COMMENTS 20       0.000
```

```
MATERIAL CODE DG111                                     MATERIAL CODE DG111

       CLASSIFICATION  1       -0.000 SOR, SILICA GEL
          COMPOSITION  2       -0.000 SIO2 99.7, AL2O3 .10, TIO2 .09
     COST, 2CD ACTIVE  3     9800.000 NONE
      AVAILABLE SIZES  4       -0.000 35 TO 60 (TYLER SIEVE)
     AVAILABLE SHAPES  5       -0.000 GRANULAR
       CRUSH STRENGTH  6        0.000
             HARDNESS  7        0.000
            PORE SIZE  8        0.000
          PORE VOLUME  9         .430 AT 1750 F
         SURFACE AREA 10      800.000
         BULK DENSITY 11       44.500
       CRYSTALLINITY 12        0.000
     CRYSTALLITE SIZE 13        0.000
           MAJOR USES 14       -0.000 SELECTIVE ADSORPTION- USED FOR
           MAJOR USES 15       -0.000 LIQUID OR GAS PHASE SEPARATION
           VOLATILITY 16        6.500
     PARTICLE DENSITY 17        0.000
       MAX. OP. TEMP. 18        0.000
            ATTRITION 19        0.000
             COMMENTS 20        0.000


MATERIAL CODE DG112                                     MATERIAL CODE DG112

       CLASSIFICATION  1       -0.000 SOR, SILICA GEL
          COMPOSITION  2       -0.000 SIO2 99.7, AL2O3 .10, TIO2 .09
     COST. 2CD ACTIVE  3        0.000 NONE
      AVAILABLE SIZES  4       -0.000 35 TO 60 (TYLER SIEVE)
     AVAILABLE SHAPES  5       -0.000 GRANULAR
       CRUSH STRENGTH  6        0.000
             HARDNESS  7        0.000
            PORE SIZE  8        0.000
          PORE VOLUME  9        1.150
         SURFACE AREA 10      300.000
         BULK DENSITY 11       24.000
       CRYSTALLINITY 12        0.000
     CRYSTALLITE SIZE 13        0.000
           MAJOR USES 14       -0.000 SELECTIVE ADSORPTION- USED FOR
           MAJOR USES 15       -0.000 LIQUID OR GAS PHASE SEPARATION
           VOLATILITY 16        4.500 AT 1750 F
     PARTICLE DENSITY 17        0.000
       MAX. OP. TEMP. 18        0.000
            ATTRITION 19        0.000
             COMMENTS 20        0.000
```

```
MATERIAL CODE DG113                                    MATERIAL CODE DG113

       CLASSIFICATION  1      -0.000 SOR, SILICA GEL
          COMPOSITION  2      -0.000 SIO2 99.7, AL2O3 .10, TIO2 .09
     COST, 2CD ACTIVE  3    1900.000 NONE
      AVAILABLE SIZES  4      -0.000 60 TO 200 (TYLER SIEVE)
     AVAILABLE SHAPES  5      -0.000 GRANULAR
       CRUSH STRENGTH  6       0.000
             HARDNESS  7       0.000
            PORE SIZE  8       0.000
          PORE VOLUME  9       1.150
         SURFACE AREA 10     340.000
         BULK DENSITY 11      25.000
        CRYSTALLINITY 12       0.000
     CRYSTALLITE SIZE 13       0.000
           MAJOR USES 14      -0.000 SELECTIVE ADSORPTION- USED FOR
           MAJOR USES 15      -0.000 LIQUID OR GAS PHASE SEPARATION
           VOLATILITY 16       6.500 AT 1750 F
     PARTICLE DENSITY 17       0.000
      MAX. OP. TEMP. 18       0.000
            ATTRITION 19       0.000
             COMMENTS 20       0.000


MATERIAL CODE DG114                                    MATERIAL CODE DG114

       CLASSIFICATION  1      -0.000 SOR, SILICA GEL
          COMPOSITION  2      -0.000 SIO2 99.7, AL2O3 .10, TIO2 .09
     COST, 2CD ACTIVE  3    5500.000 NONE
      AVAILABLE SIZES  4      -0.000 200 TO 325 (TYLER SIEVE)
     AVAILABLE SHAPES  5      -0.000 GRANULAR
       CRUSH STRENGTH  6       0.000
             HARDNESS  7       0.000
            PORE SIZE  8       0.000
          PORE VOLUME  9        .450
         SURFACE AREA 10     800.000
         BULK DENSITY 11      46.000
        CRYSTALLINITY 12       0.000
     CRYSTALLITE SIZE 13       0.000
           MAJOR USES 14      -0.000 SELECTIVE ADSORPTION- USED FOR
           MAJOR USES 15      -0.000 LIQUID OR GAS PHASE SEPARATION
           VOLATILITY 16       6.000 AT 1750 F
     PARTICLE DENSITY 17       0.000
      MAX. OP. TEMP. 18       0.000
            ATTRITION 19       0.000
             COMMENTS 20       0.000
```

```
MATERIAL CODE DG115                                       MATERIAL CODE DG115

       CLASSIFICATION  1       -0.000 SOR, SILICA GEL
          COMPOSITION  2       -0.000 SIO2 99.7, AL203 .10, TIO2 .09
     COST, 2CD ACTIVE  3    11900.000 NONE
      AVAILABLE SIZES  4       -0.000 100 TO 200 (TYLER SIEVE)
     AVAILABLE SHAPES  5       -0.000 GRANULAR
       CRUSH STRENGTH  6        0.000
             HARDNESS  7        0.000
            PORE SIZE  8        0.000
          PORE VOLUME  9         .400
         SURFACE AREA 10      700.000
         BULK DENSITY 11       46.000
        CRYSTALLINITY 12        0.000
     CRYSTALLITE SIZE 13        0.000
           MAJOR USES 14       -0.000 SELECTIVE ADSORPTION- USED FOR
           MAJOR USES 15       -0.000 LIQUID OR GAS PHASE SEPARATION
           VOLATILITY 16        6.500 AT 1750 F
     PARTICLE DENSITY 17        0.000
       MAX. OP. TEMP. 18        0.000
            ATTRITION 19        0.000
             COMMENTS 20        0.000


MATERIAL CODE DG116                                       MATERIAL CODE DG116

       CLASSIFICATION  1       -0.000 SOR, SILICA GEL
          COMPOSITION  2       -0.000 SIO2 99.7, AL203 .10, TIO2 .09
     COST, 2CD ACTIVE  3     4950.000 NONE
      AVAILABLE SIZES  4       -0.000 60 TO 200 (TYLER SIEVE)
     AVAILABLE SHAPES  5       -0.000 GRANULAR
       CRUSH STRENGTH  6        0.000
             HARDNESS  7        0.000
            PORE SIZE  8        0.000
          PORE VOLUME  9         .400
         SURFACE AREA 10      700.000
         BULK DENSITY 11       46.000
        CRYSTALLINITY 12        0.000
     CRYSTALLITE SIZE 13        0.000
           MAJOR USES 14       -0.000 SELECTIVE ADSORPTION- USED FOR
           MAJOR USES 15       -0.000 LIQUID OR GAS PHASE SEPARATION
           VOLATILITY 16        6.500
     PARTICLE DENSITY 17        0.000
       MAX. OP. TEMP. 18        0.000
            ATTRITION 19        0.000
             COMMENTS 20        0.000
```

```
MATERIAL CODE DG117                                    MATERIAL CODE DG117

     CLASSIFICATION  1      -0.000 SOR, SILICA GEL
        COMPOSITION  2      -0.000 SIO2 99.7, AL203 .10 TIO2 .09
    COST, 2CD ACTIVE  3       0.000 NONE
    AVAILABLE SIZES  4      -0.000 8 (TYLER SIEVE)
   AVAILABLE SHAPES  5      -0.000 GRANULAR
     CRUSH STRENGTH  6       0.000
           HARDNESS  7       0.000
          PORE SIZE  8       0.000
        PORE VOLUME  9       0.000
       SURFACE AREA 10       0.000
       BULK DENSITY 11      46.000
      CRYSTALLINITY 12       0.000
    CRYSTALLITE SIZE 13       0.000
         MAJOR USES 14      -0.000 DESSICANT
         MAJOR USES 15       0.000
         VOLATILITY 16       6.500
    PARTICLE DENSITY 17       0.000
     MAX. OP. TEMP. 18       0.000
          ATTRITION 19       0.000
           COMMENTS 20      -0.000 COLORED LT. BROWN


MATERIAL CODE DG118                                    MATERIAL CODE DG118

     CLASSIFICATION  1      -0.000 SOR, SILICA GEL
        COMPOSITION  2      -0.000 SIO2 99.7, AL203 .10, TIO2 .09
    COST, 2CD ACTIVE  3       0.000 NONE
    AVAILABLE SIZES  4      -0.000 80 (TYLER SIEVE)
   AVAILABLE SHAPES  5      -0.000 GRANULAR
     CRUSH STRENGTH  6       0.000
           HARDNESS  7       5.000 MOH SCALE
          PORE SIZE  8       0.000
        PORE VOLUME  9       0.000
       SURFACE AREA 10       0.000
       BULK DENSITY 11      48.100
      CRYSTALLINITY 12      -0.000 AMORPHOUS
    CRYSTALLITE SIZE 13       0.000
         MAJOR USES 14      -0.000 SOURCE OF SIO2 IN CHEM REAX
         MAJOR USES 15      -0.000 ANTI-CAKING AGENT
         VOLATILITY 16      10.000 AT 1750 F
    PARTICLE DENSITY 17     137.300
     MAX. OP. TEMP. 18       0.000
          ATTRITION 19       0.000
           COMMENTS 20       0.000
```

```
MATERIAL CODE DG119                                          MATERIAL CODE DG119

      CLASSIFICATION  1        -0.000 SOR, SILICA GEL
         COMPOSITION  2        -0.000 SIO2 99.7, AL2O3 .10, TIO2 .09
   COST, 2CD ACTIVE   3      1240.000 NONE
    AVAILABLE SIZES   4        -0.000 6 TO 16 (TYLER SIEVE)
   AVAILABLE SHAPES   5        -0.000 GRANULAR
     CRUSH STRENGTH   6         0.000
           HARDNESS   7         0.000
          PORE SIZE   8         0.000
        PORE VOLUME   9         0.000
       SURFACE AREA  10         0.000
       BULK DENSITY  11        48.000
      CRYSTALLINITY  12         0.000
   CRYSTALLITE SIZE  13         0.000
         MAJOR USES  14        -0.000 INDICATING DESICCANT
         MAJOR USES  15         0.000
         VOLATILITY  16         5.600 AT 1750 F
   PARTICLE DENSITY  17         0.000
     MAX. OP. TEMP.  18         0.000
          ATTRITION  19         0.000
           COMMENTS  20        -0.000 CHNGES COLOR AS HUMIDITY CHNGS


MATERIAL CODE DG120                                          MATERIAL CODE DG120

      CLASSIFICATION  1        -0.000 SOR, SILICA GEL
         COMPOSITION  2        -0.000 SIO2 99.7, AL2O3 .10, TIO2 .09
   COST, 2CD ACTIVE   3         0.000 NONE
    AVAILABLE SIZES   4        -0.000 14 TO 20 (TYLER SIEVE)
   AVAILABLE SHAPES   5        -0.000 GRANULAR
     CRUSH STRENGTH   6         0.000
           HARDNESS   7         0.000
          PORE SIZE   8         0.000
        PORE VOLUME   9         0.000
       SURFACE AREA  10         0.000
       BULK DENSITY  11        47.500
      CRYSTALLINITY  12         0.000
   CRYSTALLITE SIZE  13         0.000
         MAJOR USES  14        -0.000 INDICATING DESICCANT
         MAJOR USES  15         0.000
         VOLATILITY  16         5.600 AT 1750 F
   PARTICLE DENSITY  17         0.000
     MAX. OP. TEMP.  18         0.000
          ATTRITION  19         0.000
           COMMENTS  20         0.000
```

```
MATERIAL CODE DG121                                          MATERIAL CODE DG121

        CLASSIFICATION  1        -0.000 SOR, SILICA GEL
           COMPOSITION  2        -0.000 SIO2 99.7, AL2O3 .10, TIO2 .09
      COST, 2CD ACTIVE  3      1600.000 NONE
       AVAILABLE SIZES  4        -0.000 3 TO 8 (TYLER SIEVE)
      AVAILABLE SHAPES  5        -0.000 GRANULAR
        CRUSH STRENGTH  6         0.000
              HARDNESS  7         0.000
             PORE SIZE  8         0.000
           PORE VOLUME  9         0.000
          SURFACE AREA 10         0.000
          BULK DENSITY 11        47.000
         CRYSTALLINITY 12         0.000
      CRYSTALLITE SIZE 13         0.000
           MAJOR USES  14        -0.000 INDICATING DESICCANT
           MAJOR USES  15         0.000
            VOLATILITY 16         5.600 AT 1750 F
      PARTICLE DENSITY 17         0.000
        MAX. OP. TEMP. 18         0.000
             ATTRITION 19         0.000
              COMMENTS 20         0.000


MATERIAL CODE DG122                                          MATERIAL CODE DG122

        CLASSIFICATION  1        -0.000 SOR, SILICA GEL
           COMPOSITION  2        -0.000 SIO2 99.7, AL2O3 .10, TIO2 .09
      COST, 2CD ACTIVE  3      2000.000 NONE
       AVAILABLE SIZES  4        -0.000 6 TO 16 (TYLER SIEVE)
      AVAILABLE SHAPES  5        -0.000 GRANULAR
        CRUSH STRENGTH  6         0.000
              HARDNESS  7         0.000
             PORE SIZE  8         0.000
           PORE VOLUME  9         0.000
          SURFACE AREA 10         0.000
          BULK DENSITY 11        48.000
         CRYSTALLINITY 12         0.000
      CRYSTALLITE SIZE 13         0.000
           MAJOR USES  14        -0.000 INDICATING DESICCANT
           MAJOR USES  15         0.000
            VOLATILITY 16         6.500 AT 1750 F
      PARTICLE DENSITY 17         0.000
        MAX. OP. TEMP. 18         0.000
             ATTRITION 19         0.000
              COMMENTS 20         0.000
```

```
MATERIAL CODE DG123                                      MATERIAL CODE DG123

         CLASSIFICATION  1       -0.000 SOR, SILICA GEL
            COMPOSITION  2       -0.000 SIO2 99.7, AL2O3 .10, TIO2 .09
      COST, 2CD ACTIVE   3      700.000 NONE
        AVAILABLE SIZES  4       -0.000 3 TO 8 (TYLER SIEVE)
       AVAILABLE SHAPES  5       -0.000 GRANULAR
         CRUSH STRENGTH  6        0.000
               HARDNESS  7        0.000
              PORE SIZE  8        0.000
            PORE VOLUME  9        1.150
           SURFACE AREA 10      340.000
           BULK DENSITY 11       25.000
         CRYSTALLINITY  12        0.000
       CRYSTALLITE SIZE 13        0.000
            MAJOR USES  14       -0.000 DESICCANT
            MAJOR USES  15        0.000
             VOLATILITY 16        3.500 AT 1750 F
       PARTICLE DENSITY 17        0.000
        MAX. OP. TEMP.  18        0.000
              ATTRITION 19        0.000
               COMMENTS 20       -0.000 VERY POROUS


MATERIAL CODE DG124                                      MATERIAL CODE DG124

         CLASSIFICATION  1       -0.000 SOR, SILICA GEL
            COMPOSITION  2       -0.000 SIO2 99.7, AL2O3 .10, TIO2 .09
      COST, 2CD ACTIVE   3      700.000 NONE
        AVAILABLE SIZES  4       -0.000 325 (TYLER SIEVE)
       AVAILABLE SHAPES  5       -0.000 GRANULAR
         CRUSH STRENGTH  6        0.000
               HARDNESS  7        0.000
              PORE SIZE  8        0.000
            PORE VOLUME  9        0.000
           SURFACE AREA 10        0.000
           BULK DENSITY 11       33.000
         CRYSTALLINITY  12        0.000
       CRYSTALLITE SIZE 13        0.000
            MAJOR USES  14       -0.000 ANTI-CAKING AGENT
            MAJOR USES  15        0.000
             VOLATILITY 16        6.500 AT 1750 F
       PARTICLE DENSITY 17        0.000
        MAX. OP. TEMP.  18        0.000
              ATTRITION 19        0.000
               COMMENTS 20        0.000
```

```
MATERIAL CODE DG125                                           MATERIAL CODE DG125

      CLASSIFICATION  1         -0.000 SOR, SILICA GEL
         COMPOSITION  2         -0.000 SIO2 99.7, AL2O3 .10, TIO2 .09
    COST, 2CD ACTIVE  3        880.000 NONE
     AVAILABLE SIZES  4         -0.000 50 TO 200 (TYLER STEVE)
    AVAILABLE SHAPES  5         -0.000 GRANULAR
      CRUSH STRENGTH  6          0.000
            HARDNESS  7          0.000
           PORE SIZE  8          0.000
         PORE VOLUME  9           .700
        SURFACE AREA 10        600.000
        BULK DENSITY 11         37.000
      CRYSTALLINITY  12          0.000
    CRYSTALLITE SIZE 13          0.000
          MAJOR USES 14         -0.000 DESICCANT, POSSIBLE USE AS CAR
          MAJOR USES 15         -0.000 OR AS SELECTIVE ADSORBANT
          VOLATILITY 16          8.000 AT 1750 F
    PARTICLE DENSITY 17          0.000
      MAX. OP. TEMP. 18          0.000
           ATTRITION 19          0.000
            COMMENTS 20          0.000


MATERIAL CODE DG126                                           MATERIAL CODE DG126

      CLASSIFICATION  1         -0.000 SOR, SILICA GEL
         COMPOSITION  2         -0.000 SIO2 99.7, AL2O3 .10, TIO2 .09
    COST, 2CD ACTIVE  3        770.000 NONE
     AVAILABLE SIZES  4         -0.000 100 (TYLER MESH)
    AVAILABLE SHAPES  5         -0.000 GRANULAR
      CRUSH STRENGTH  6          0.000
            HARDNESS  7          0.000
           PORE SIZE  8          0.000
         PORE VOLUME  9          0.000
        SURFACE AREA 10          0.000
        BULK DENSITY 11         65.000
       CRYSTALLINITY 12          0.000
    CRYSTALLITE SIZE 13          0.000
          MAJOR USES 14         -0.000 USED TO INTRODUCE H2O TO SYSTM
          MAJOR USES 15          0.000
          VOLATILITY 16         68.000 AT 1750 F
    PARTICLE DENSITY 17          0.000
      MAX. OP. TEMP. 18          0.000
           ATTRITION 19          0.000
            COMMENTS 20          0.000
```

```
MATERIAL CODE DG127                                      MATERIAL CODE DG127

        CLASSIFICATION  1      -0.000 SOR, SILICA GEL
           COMPOSITION  2      -0.000 SIO2 99.7, AL2O3 .10, TIO2 .09
      COST, 2CD ACTIVE  3    5900.000 NONE
       AVAILABLE SIZES  4      -0.000 250 (TYLER SIEVE)
      AVAILABLE SHAPES  5      -0.000 GRANULAR
        CRUSH STRENGTH  6       0.000
              HARDNESS  7       0.000
             PORE SIZE  8       0.000
           PORE VOLUME  9        .750
          SURFACE AREA 10     550.000
          BULK DENSITY 11      31.000
         CRYSTALLINITY 12       0.000
      CRYSTALLITE SIZE 13       0.000
            MAJOR USES 14      -0.000 CHROMATOGRAPHIC SEPARATION
            MAJOR USES 15       0.000
            VOLATILITY 16      12.000 AT 1750 F
      PARTICLE DENSITY 17       0.000
        MAX. OP. TEMP. 18       0.000
             ATTRITION 19       0.000
              COMMENTS 20       0.000


MATERIAL CODE DG201                                      MATERIAL CODE DG201

        CLASSIFICATION  1      -0.000 CRR, SILICA-ALUMINA,ZEOLITE
           COMPOSITION  2      -0.000 AL2O3 31, SIO2 69, SO4 0.4
      COST, 2CD ACTIVE  3    3700.000 NONE
       AVAILABLE SIZES  4      -0.000 61 MICRONS
      AVAILABLE SHAPES  5      -0.000 POWDER, ALSO PELLETS
        CRUSH STRENGTH  6       0.000
              HARDNESS  7       0.000
             PORE SIZE  8       0.000
           PORE VOLUME  9        .600
          SURFACE AREA 10     325.000
          BULK DENSITY 11      32.000
         CRYSTALLINITY 12       0.000
      CRYSTALLITE SIZE 13       0.000
            MAJOR USES 14       0.000
            MAJOR USES 15       0.000
            VOLATILITY 16       0.000
      PARTICLE DENSITY 17       0.000
        MAX. OP. TEMP. 18       0.000
             ATTRITION 19       0.000
              COMMENTS 20      -0.000 ATTRITION RESIST. IN FLUID BED
```

```
MATERIAL CODE DG202                                        MATERIAL CODE DG202

          CLASSIFICATION  1     -0.000 CRR, SILICA-ALUMINA, ZEOLITE
             COMPOSITION  2     -0.000 SIO2 87, AL203 13
        COST, 2CD ACTIVE  3   3700.000 NONE
         AVAILABLE SIZES  4     -0.000 3/16X3/16 INCH
        AVAILABLE SHAPES  5     -0.000 CYLINDRICAL PELLETS
          CRUSH STRENGTH  6      0.000
                HARDNESS  7      0.000
               PORE SIZE  8    143.000
             PORE VOLUME  9       .340
            SURFACE AREA 10     95.000
            BULK DENSITY 11     41.000
           CRYSTALLINITY 12      0.000
        CRYSTALLITE SIZE 13      0.000
              MAJOR USES 14     -0.000 DEHYDRATION REACTIONS
              MAJOR USES 15      0.000
              VOLATILITY 16      0.000
        PARTICLE DENSITY 17      0.000
          MAX. OP. TEMP. 18      0.000
               ATTRITION 19      0.000
                COMMENTS 20      0.000


MATERIAL CODE DG203                                        MATERIAL CODE DG203

          CLASSIFICATION  1     -0.000 CRR, SILICA GEL
             COMPOSITION  2     -0.000 SIO2 99.7,FE .03,NA20 .02
        COST, 2CD ACTIVE  3   1240.000 NONE
         AVAILABLE SIZES  4     -0.000 3-200 MESH
        AVAILABLE SHAPES  5     -0.000 GRANULES
          CRUSH STRENGTH  6      0.000
                HARDNESS  7      0.000
               PORE SIZE  8     22.000
             PORE VOLUME  9       .450
            SURFACE AREA 10    800.000
            BULK DENSITY 11     43.000
           CRYSTALLINITY 12      0.000
        CRYSTALLITE SIZE 13      0.000
              MAJOR USES 14     -0.000 CARRIER / SUPPORT FOR CATALYST
              MAJOR USES 15     -0.000 USED IN THE CHEMICAL INDUSTRY.
              VOLATILITY 16      6.000
        PARTICLE DENSITY 17      0.000
          MAX. OP. TEMP. 18      0.000
               ATTRITION 19      0.000
                COMMENTS 20      0.000
```

```
MATERIAL CODE DG204                                    MATERIAL CODE DG204

        CLASSIFICATION  1       -0.000 CRR, SILICA GEL
           COMPOSITION  2       -0.000 SIO2 99.5, NA2O .09, FE .02
     COST, 2CD ACTIVE   3      700.000 NONE
       AVAILABLE SIZES  4       -0.000 ON 10 MESH(FINER SIZES ON REQ)
      AVAILABLE SHAPES  5       -0.000 GRANULES
        CRUSH STRENGTH  6        0.000
              HARDNESS  7        0.000
             PORE SIZE  8      120.000
           PORE VOLUME  9        1.040
          SURFACE AREA 10      350.000
          BULK DENSITY 11       27.000
        CRYSTALLINITY  12        0.000
     CRYSTALLITE SIZE  13        0.000
            MAJOR USES 14       -0.000 CARRIER / SUPPORT FOR CATALYST
            MAJOR USES 15       -0.000 USED IN THE CHEMICAL INDUSTRY.
            VOLATILITY 16        4.500
      PARTICLE DENSITY 17        0.000
       MAX. OP. TEMP.  18        0.000
             ATTRITION 19        0.000
              COMMENTS 20        0.000


MATERIAL CODE DG205                                    MATERIAL CODE DG205

        CLASSIFICATION  1       -0.000 CRR, SILICA GEL
           COMPOSITION  2       -0.000 SIO2 99.6, FE .03, NA2O .02
     COST, 2CD ACTIVE   3     1200.000 NONE
       AVAILABLE SIZES  4       -0.000 ON 4 MESH(FINER SIZES ON REQ.)
      AVAILABLE SHAPES  5       -0.000 GRANULES
        CRUSH STRENGTH  6        0.000
              HARDNESS  7        0.000
             PORE SIZE  8       20.000
           PORE VOLUME  9         .300
          SURFACE AREA 10      600.000
          BULK DENSITY 11       50.000
        CRYSTALLINITY  12        0.000
     CRYSTALLITE SIZE  13        0.000
            MAJOR USES 14       -0.000 CARRIER / SUPPORT FOR CATALYST
            MAJOR USES 15       -0.000 USED IN THE CHEMICAL INDUSTRY.
            VOLATILITY 16        2.000
      PARTICLE DENSITY 17        0.000
       MAX. OP. TEMP.  18        0.000
             ATTRITION 19        0.000
              COMMENTS 20        0.000
```

```
MATERIAL CODE DG206                                              MATERIAL CODE DG206

      CLASSIFICATION  1        -0.000 CRR, SILICA GEL
         COMPOSITION  2        -0.000 SIO2 99.5, FE .03, NA20 .02
    COST, 2CD ACTIVE  3      1500.000 NONE
     AVAILABLE SIZES  4        -0.000 100-325 MESH
    AVAILABLE SHAPES  5        -0.000 GRANULES
      CRUSH STRENGTH  6         0.000
            HARDNESS  7         0.000
           PORE SIZE  8       168.000
         PORE VOLUME  9         1.200
       SURFACE AREA  10       285.000
        BULK DENSITY 11        24.000
       CRYSTALLINITY 12         0.000
    CRYSTALLITE SIZE 13         0.000
          MAJOR USES 14        -0.000 CARRIER / SUPPORT FOR CATALYST
          MAJOR USES 15        -0.000 USED IN THE CHEMICAL INDUSTRY.
          VOLATILITY 16         5.500
    PARTICLE DENSITY 17         0.000
      MAX. OP. TEMP. 18         0.000
           ATTRITION 19         0.000
            COMMENTS 20         0.000


MATERIAL CODE DG208                                              MATERIAL CODE DG208

      CLASSIFICATION  1        -0.000 CRR, SILICA GEL
         COMPOSITION  2        -0.000 SIO2 99.5,FE .02,AL203 .20
    COST, 2CD ACTIVE  3       760.000 NONE
     AVAILABLE SIZES  4        -0.000 54 TO 65 MICRONS
    AVAILABLE SHAPES  5        -0.000 GRANULES (MICROSPHEROIDAL)
      CRUSH STRENGTH  6         0.000
            HARDNESS  7         0.000
           PORE SIZE  8        67.000
         PORE VOLUME  9         1.000
       SURFACE AREA  10       600.000
        BULK DENSITY 11        28.000
       CRYSTALLINITY 12         0.000
    CRYSTALLITE SIZE 13         0.000
          MAJOR USES 14        -0.000 CARRIER / SUPPORT FOR CATALYST
          MAJOR USES 15        -0.000 USED IN THE CHEMICAL INDUSTRY.
          VOLATILITY 16        10.000
    PARTICLE DENSITY 17         0.000
      MAX. OP. TEMP. 18         0.000
           ATTRITION 19         0.000
            COMMENTS 20         0.000
```

```
MATERIAL CODE DG209                                   MATERIAL CODE DG209

      CLASSIFICATION  1      -0.000 CRR, SILICA GEL
         COMPOSITION  2      -0.000 SIO2 99.5,NAO2 .09,FE .02
   COST, 2CD ACTIVE   3    2000.000 NONE
     AVAILABLE SIZES  4      -0.000 54 TO 65 MICRONS
    AVAILABLE SHAPES  5      -0.000 GRANULES (MICROSPHEROIDAL)
      CRUSH STRENGTH  6       0.000
            HARDNESS  7       0.000
           PORE SIZE  8     200.000
         PORE VOLUME  9       1.700
        SURFACE AREA 10     350.000
        BULK DENSITY 11      25.000
       CRYSTALLINITY 12       0.000
    CRYSTALLITE SIZE 13       0.000
          MAJOR USES 14      -0.000 CARRIER / SUPPORT FOR CATALYST
          MAJOR USES 15      -0.000 USED IN THE CHEMICAL INDUSTRY.
          VOLATILITY 16       5.000
    PARTICLE DENSITY 17       0.000
     MAX. OP. TEMP.  18       0.000
           ATTRITION 19       0.000
            COMMENTS 20       0.000
```

```
MATERIAL CODE DG210                                   MATERIAL CODE DG210

      CLASSIFICATION  1      -0.000 CAT, SILICA/MAGNESIA
         COMPOSITION  2      -0.000 SIO2 70%, MGO 30% (DRY BASIS)
   COST, 2CD ACTIVE   3     660.000 MGO
     AVAILABLE SIZES  4      -0.000 1/8X1/8 IN. OR 3/16X3/16 IN.
    AVAILABLE SHAPES  5      -0.000 EXTRUSION
      CRUSH STRENGTH  6       0.000
            HARDNESS  7       0.000
           PORE SIZE  8       0.000
         PORE VOLUME  9        .650
        SURFACE AREA 10     500.000
        BULK DENSITY 11      42.000
       CRYSTALLINITY 12       0.000
    CRYSTALLITE SIZE 13       0.000
          MAJOR USES 14      -0.000 ESTERIFICATION REACTIONS; GAS/
          MAJOR USES 15      -0.000 OIL CRACKING (SUPPORT CAT.).
          VOLATILITY 16      12.000
    PARTICLE DENSITY 17       0.000
     MAX. OP. TEMP.  18       0.000
           ATTRITION 19       0.000
            COMMENTS 20      -0.000 ALSO AVAILABLE AS A FLUID.
```

```
MATERIAL CODE DG211                                       MATERIAL CODE DG211

      CLASSIFICATION  1      -0.000 CAT, SILICA/ALUMINA
         COMPOSITION  2      -0.000 SIO2 87, AL203 13, IMPURITY .3
   COST, 2CD ACTIVE   3    1500.000 AL203
    AVAILABLE SIZES   4      -0.000 3/16 INCH DIAMETER
   AVAILABLE SHAPES   5      -0.000 EXTRUSION
     CRUSH STRENGTH   6      12.000
           HARDNESS   7       0.000
          PORE SIZE   8       0.000
        PORE VOLUME   9       1.000
       SURFACE AREA  10     400.000
       BULK DENSITY  11      24.000
     CRYSTALLINITY   12       0.000
   CRYSTALLITE SIZE  13       0.000
         MAJOR USES  14      -0.000 REACTIONS REQ G AN ACID CATALY
         MAJOR USES  15      -0.000 ST (ALKYATION,ESTERIFICATION).
         VOLATILITY  16       0.000
   PARTICLE DENSITY  17       0.000
     MAX. OP. TEMP.  18       0.000
          ATTRITION  19       0.000
           COMMENTS  20      -0.000 HIGH ACIDITY

MATERIAL CODE DG212                                       MATERIAL CODE DG212

      CLASSIFICATION  1      -0.000 CAT, PELLETED SILICA/ALUMINA
         COMPOSITION  2      -0.000 SIO2 87,AL203 13,FE203 .05
   COST, 2CD ACTIVE   3    2700.000 NONE
    AVAILABLE SIZES   4      -0.000 1/8X1/8 OR 3/16X3/16 CYLINDERS
   AVAILABLE SHAPES   5      -0.000 PELLETS
     CRUSH STRENGTH   6       0.000
           HARDNESS   7       0.000
          PORE SIZE   8      60.000
        PORE VOLUME   9        .750
       SURFACE AREA  10     500.000
       BULK DENSITY  11      32.000
     CRYSTALLINITY   12       0.000
   CRYSTALLITE SIZE  13       0.000
         MAJOR USES  14      -0.000 DEHYDRATION CATALYST
         MAJOR USES  15       0.000
         VOLATILITY  16       0.000
   PARTICLE DENSITY  17       0.000
     MAX. OP. TEMP.  18       0.000
          ATTRITION  19       0.000
           COMMENTS  20       0.000
```

```
MATERIAL CODE DG213                                      MATERIAL CODE DG213

      CLASSIFICATION  1       -0.000 CAT, PELLETED SILICA/ALUMINA
         COMPOSITION  2       -0.000 SI02 75,AL203 25,FE203 .05
    COST, 2CD ACTIVE  3     2800.000 NONE
     AVAILABLE SIZES  4       -0.000 1/8X1/8 OR 3/16X3/16 CYLINDERS
    AVAILABLE SHAPES  5       -0.000 PELLETS
      CRUSH STRENGTH  6        0.000
            HARDNESS  7        0.000
           PORE SIZE  8       70.000
         PORE VOLUME  9         .700
        SURFACE AREA 10      400.000
        BULK DENSITY 11       39.000
       CRYSTALLINITY 12        0.000
    CRYSTALLITE SIZE 13        0.000
          MAJOR USES 14       -0.000 DEHYDRATION CATALYST
          MAJOR USES 15        0.000
          VOLATILITY 16        0.000
    PARTICLE DENSITY 17        0.000
      MAX. OP. TEMP. 18        0.000
           ATTRITION 19        0.000
            COMMENTS 20        0.000


MATERIAL CODE DG301                                      MATERIAL CODE DG301

      CLASSIFICATION  1       -0.000 SOR, MOLECULAR  SIEVE
         COMPOSITION  2       -0.000 NOT GIVEN
    COST, 2CD ACTIVE  3     2300.000 NOT GIVEN
     AVAILABLE SIZES  4       -0.000 4-8 + 8-12 MESH; 3-5 MICRONS
    AVAILABLE SHAPES  5       -0.000 SPHERES ; GRANULES
      CRUSH STRENGTH  6       11.000 4-8 MESH ; 7 LBS. 8-12 MESH
            HARDNESS  7        0.000
           PORE SIZE  8        3.000
         PORE VOLUME  9        0.000
        SURFACE AREA 10        0.000
        BULK DENSITY 11       46.000 SPHERES ;32LBS. POWDER
       CRYSTALLINITY 12       -0.000 CUBIC
    CRYSTALLITE SIZE 13        0.000
          MAJOR USES 14       -0.000 DRYING UNSATURATED HYDROCARBON
          MAJOR USES 15       -0.000 (ETHYLENE,PROPYLENE,BUTADIENE)
          VOLATILITY 16        0.000
    PARTICLE DENSITY 17        0.000
      MAX. OP. TEMP. 18        0.000
           ATTRITION 19        0.000
            COMMENTS 20        0.000
```

```
MATERIAL CODE DG302                                        MATERIAL CODE DG302

      CLASSIFICATION  1        -0.000 SOR, MOLECULAR SIEVE
        COMPOSITION  2        -0.000 NOT GIVEN
     COST, 2CD ACTIVE  3     2400.000 NOT GIVEN
      AVAILABLE SIZES  4        -0.000 4-8;8-12 + 20-50 MESH/3-5 MICR
     AVAILABLE SHAPES  5        -0.000 SPHERES ; GRANULES
       CRUSH STRENGTH  6        11.000 4-8 MESH ; 7 LBS. 8-12 MESH
             HARDNESS  7         0.000
            PORE SIZE  8         5.000
          PORE VOLUME  9         0.000
         SURFACE AREA 10         0.000
         BULK DENSITY 11        44.000 SPHERES ; 30 LBS. POWDER
       CRYSTALLINITY 12        -0.000 CUBIC
     CRYSTALLITE SIZE 13         0.000
           MAJOR USES 14        -0.000 REMOVAL OF H2S, CO2, + ETHYL
           MAJOR USES 15        -0.000 MERCAPTAN FROM NATURAL GAS.
           VOLATILITY 16         0.000
     PARTICLE DENSITY 17         0.000
       MAX. OP. TEMP. 18         0.000
            ATTRITION 19         0.000
             COMMENTS 20         0.000


MATERIAL CODE DG303                  -                     MATERIAL CODE DG303

       CLASSIFICATION  1        -0.000 SOR, MOLECULAR SIEVE
          COMPOSITION  2        -0.000 NOT GIVEN
     COST, 2CD ACTIVE  3     2200.000 NOT GIVEN
      AVAILABLE SIZES  4        -0.000 4 MESH SIZES;8-30 MESH
     AVAILABLE SHAPES  5        -0.000 SPHERES,GRANULES
       CRUSH STRENGTH  6        11.000 4-8 MESH ; 7 LBS. 8-12 MESH
             HARDNESS  7         0.000
            PORE SIZE  8         4.000
          PORE VOLUME  9         0.000
         SURFACE AREA 10         0.000
         BULK DENSITY 11        44.000 SPHERES ; 30 LBS, POWDER
        CRYSTALLINITY 12        -0.000 CUBIC
     CRYSTALLITE SIZE 13         0.000
           MAJOR USES 14        -0.000 DEHYDRATION OF MOST FLUIDS
           MAJOR USES 15         0.000
           VOLATILITY 16         0.000
     PARTICLE DENSITY 17         0.000
       MAX. OP. TEMP. 18         0.000
            ATTRITION 19         0.000
             COMMENTS 20         0.000
```

```
MATERIAL CODE DG304                                        MATERIAL CODE DG304

      CLASSIFICATION  1        -0.000 SOR, MOLECULAR SIEVE
         COMPOSITION  2        -0.000 NOT GIVEN
    COST, 2CD ACTIVE  3      3000.000 NOT GIVEN
     AVAILABLE SIZES  4        -0.000 4-8,8-12 MESH ;3-5 MICRONS
    AVAILABLE SHAPES  5        -0.000 SPHERES ; GRANULES
      CRUSH STRENGTH  6        10.000 4-8 MESH ;6 LBS. 8-12 MESH
            HARDNESS  7         0.000
           PORE SIZE  8        10.000
         PORE VOLUME  9         0.000
        SURFACE AREA 10         0.000
        BULK DENSITY 11        43.000 SPHERES ; 30 LBS. POWDER
       CRYSTALLINITY 12        -0.000 BCC (DIAMOND STRUCTURE)
    CRYSTALLITE SIZE 13         0.000
          MAJOR USES 14        -0.000 REMOVAL OF CO2 + H2O FROM AIR,
          MAJOR USES 15        -0.000 + H2S + MERCAPTAN FROM L.P.G.
          VOLATILITY 16         0.000
    PARTICLE DENSITY 17         0.000
      MAX. OP. TEMP. 18         0.000
           ATTRITION 19         0.000
            COMMENTS 20         0.000

MATERIAL CODE DG305                                        MATERIAL CODE DG305

      CLASSIFICATION  1        -0.000 SOR, MOLECULAR SIEVE
         COMPOSITION  2        -0.000 NOT GIVEN
    COST, 2CD ACTIVE  3      2640.000 NOT GIVEN
     AVAILABLE SIZES  4        -0.000 4-8,8-12,+ 14-30 MESH
    AVAILABLE SHAPES  5        -0.000 SPHERES ; GRANULES
      CRUSH STRENGTH  6        18.000 4-8 MESH ;10 LBS. 8-12 MESH
            HARDNESS  7         0.000
           PORE SIZE  8         0.000
         PORE VOLUME  9         0.000
        SURFACE AREA 10         0.000
        BULK DENSITY 11        49.000
       CRYSTALLINITY 12         0.000
    CRYSTALLITE SIZE 13         0.000
          MAJOR USES 14        -0.000 REFRIGERATION SYSTEMS
          MAJOR USES 15         0.000
          VOLATILITY 16         0.000
    PARTICLE DENSITY 17         0.000
      MAX. OP. TEMP. 18         0.000
           ATTRITION 19         0.000
            COMMENTS 20         0.000
```

```
MATERIAL CODE DP101                                          MATERIAL CODE DP101

      CLASSIFICATION  1      -0.000 CRR, ALUMINA HONEYCOMB, TORVEX
         COMPOSITION  2      -0.000 AL203 96%,MGAL204 3%,MULLITE 1
    COST, 2CD ACTIVE  3   45600.000 NONE
     AVAILABLE SIZES  4      -0.000 CELLS 1/8,3/16,1/4,3/8,3/4 IN.
    AVAILABLE SHAPES  5      -0.000 BLOCKS 12 IN.SQ., 2 IN. THICK
      CRUSH STRENGTH  6       0.000
            HARDNESS  7       0.000
           PORE SIZE  8       0.000
         PORE VOLUME  9       0.000
        SURFACE AREA 10       0.000 (384 SQ.FT/CU.FT.1/8-IN.CELL)
        BULK DENSITY 11      34.000 LB./CU.FT. FOR 1/8 IN. CELLS
       CRYSTALLINITY 12       0.000
    CRYSTALLITE SIZE 13       0.000
          MAJOR USES 14      -0.000 OXIDATION OF HYDROCARBON FUMES
          MAJOR USES 15      -0.000 REDUCTION NITROGEN OXIDE FUMES
          VOLATILITY 16       0.000
    PARTICLE DENSITY 17       0.000
      MAX. OP. TEMP. 18    2700.000 IN AIR
           ATTRITION 19       0.000
            COMMENTS 20      -0.000 STRONG, THERMALLY STABLE


MATERIAL CODE DP102                                          MATERIAL CODE DP102

      CLASSIFICATION  1      -0.000 CRR, MULLITE HONEYCOMB, TORVEX
         COMPOSITION  2      -0.000 MULLITE 55%,SIO2 30%,AL203 15%
    COST, 2CD ACTIVE  3   15200.000 NONE
     AVAILABLE SIZES  4      -0.000 CELLS 1/8,3/16,1/4.3/8,3/4 IN.
    AVAILABLE SHAPES  5      -0.000 BLOCKS 12 IN.SQ., 2 IN. THICK
      CRUSH STRENGTH  6       0.000
            HARDNESS  7       0.000
           PORE SIZE  8       0.000
         PORE VOLUME  9       0.000
        SURFACE AREA 10       0.000 (384 SQ.FT/CU.FT, 1/8-IN.CELL)
        BULK DENSITY 11      35.000 LB./CU.FT. FOR 1/8 IN. CELLS
       CRYSTALLINITY 12       0.000
    CRYSTALLITE SIZE 13       0.000
          MAJOR USES 14      -0.000 OXIDATION OF HYDROCARBON FUMES
          MAJOR USES 15      -0.000 REDUCTION NITROGEN OXIDE FUMES
          VOLATILITY 16       0.000
    PARTICLE DENSITY 17       0.000
      MAX. OP. TEMP. 18    2460.000 IN AIR
           ATTRITION 19       0.000
            COMMENTS 20      -0.000 STRONG, THERMALLY STABLE
```

```
MATERIAL CODE EN101                                          MATERIAL CODE EN101

       CLASSIFICATION  1        -0.000 CAT, KAOLIN, CRACKING
          COMPOSITION  2         0.000 SIO2 52.9%,AL2O3 45%,TIO2 1.7%
     COST, 2CD ACTIVE  3       143.000 TIO2 1.7%
      AVAILABLE SIZES  4        -0.000 3/6 TYLER MESH
     AVAILABLE SHAPES  5         0.000 CYLINDRICAL PELLETS
       CRUSH STRENGTH  6         0.000
             HARDNESS  7        95.000 BALL MILL,INDEX
            PORE SIZE  8         0.000
          PORE VOLUME  9          .250
         SURFACE AREA 10        95.000
         BULK DENSITY 11        49.000
       CRYSTALLINITY 12          0.000
     CRYSTALLITE SIZE 13         0.000
           MAJOR USES 14         0.000 CRACKING
           MAJOR USES 15         0.000
           VOLATILITY 16         2.000 AT 1800F
     PARTICLE DENSITY 17         0.000
       MAX. OP. TEMP. 18         0.000
            ATTRITION 19          .020 EXCELLENT RESISTANCE
             COMMENTS 20        -0.000 SUPERIOR, STEAM, THERMAL


MATERIAL CODE EN201                                          MATERIAL CODE EN201

       CLASSIFICATION  1        -0.000 CAT, ACTIVATED BAUXITE
          COMPOSITION  2        -0.000 AL2O3 72, FE2O3 12, SIO2 11
     COST, 2CD ACTIVE  3       113.500 FE2O3 12%
      AVAILABLE SIZES  4         0.000 10/20 MESH
     AVAILABLE SHAPES  5         0.000
       CRUSH STRENGTH  6         0.000
             HARDNESS  7         0.000
            PORE SIZE  8         0.000
          PORE VOLUME  9         0.000
         SURFACE AREA 10       175.000
         BULK DENSITY 11        56.000
        CRYSTALLINITY 12         0.000
     CRYSTALLITE SIZE 13         0.000
           MAJOR USES 14         0.000 DESULFURIZATION OF PETROLEUM
           MAJOR USES 15         0.000
           VOLATILITY 16         2.000 AT 1800F
     PARTICLE DENSITY 17         0.000
       MAX. OP. TEMP. 18         0.000
            ATTRITION 19         0.000
             COMMENTS 20         0.000
```

```
MATERIAL CODE EN202                                          MATERIAL CODE EN202

        CLASSIFICATION  1         -0.000 SOR, ACTIVATED BAUXITE
           COMPOSITION  2         -0.000 AL203 78, SIO2 9, FE203 8,
      COST, 2CD ACTIVE  3         85.000 FE203 8.0
       AVAILABLE SIZES  4         -0.000 4/8, 10/20, 10/30, 20/60 MESH
      AVAILABLE SHAPES  5          0.000
        CRUSH STRENGTH  6          0.000
              HARDNESS  7          0.000
             PORE SIZE  8          0.000
           PORE VOLUME  9          0.000
          SURFACE AREA 10        195.000 FOR 6% VOLATILE MATERIAL
          BULK DENSITY 11         57.000 FOR 6% VOLATILE MATERIAL
        CRYSTALLINITY 12           0.000
     CRYSTALLITE SIZE 13           0.000
           MAJOR USES 14          -0.000 FOR REFINING PETROLEUM PRODUCT
           MAJOR USES 15          -0.000 DECOLORIZES; DEODORIZES; DRIES
           VOLATILITY 16           6.000 ALSO AVAILABLE AS 2% VOLATILE
     PARTICLE DENSITY 17           0.000
       MAX. OP. TEMP. 18           0.000
            ATTRITION 19           0.000
             COMMENTS 20           0.000


MATERIAL CODE EN203                                          MATERIAL CODE EN203

        CLASSIFICATION  1         -0.000 CRR, ACTIVATED BAUXITE
           COMPOSITION  2         -0.000 AL203 81.5, SIO2 10.5,TIO2 3.5
      COST, 2CD ACTIVE  3        122.500 TIO2 3.5
       AVAILABLE SIZES  4         -0.000 4/8, 4/10, 4/14, 10/20 MESH
      AVAILABLE SHAPES  5          0.000
        CRUSH STRENGTH  6          0.000
              HARDNESS  7          0.000
             PORE SIZE  8          0.000
           PORE VOLUME  9          0.000
          SURFACE AREA 10        205.000 FOR 6% VOLATILE MATERIAL
          BULK DENSITY 11         55.000 FOR 6% VOLATILE MATERIAL
        CRYSTALLINITY 12           0.000
     CRYSTALLITE SIZE 13           0.000
           MAJOR USES 14           0.000
           MAJOR USES 15           0.000 .
           VOLATILITY 16           6.000 ALSO AVAILABLE AS 2% VOLATILE
     PARTICLE DENSITY 17           0.000
       MAX. OP. TEMP. 18           0.000
            ATTRITION 19           0.000
             COMMENTS 20          -0.000 ALSO USED AS SORBANT, CATALYST
```

```
MATERIAL CODE EN204                                          MATERIAL CODE EN204

       CLASSIFICATION  1      -0.000 CRR, ACTIVATED BAUXITE
          COMPOSITION  2      -0.000 AL203 93.5, SIO2 2.5, TIO2 2.0
     COST, 2CD ACTIVE  3     145.000 TIO2 2.%
      AVAILABLE SIZES  4      -0.000 2/4, 4/8, 4/10, 10/20, MESH
     AVAILABLE SHAPES  5       0.000
       CRUSH STRENGTH  6       0.000
             HARDNESS  7       0.000
            PORE SIZE  8       0.000
          PORE VOLUME  9       0.000
         SURFACE AREA 10     220.000 FOR 6% VOLATILE MATERIAL
         BULK DENSITY 11      55.000 FOR 6% VOLATILE MATERIAL
        CRYSTALLINITY 12       0.000
     CRYSTALLITE SIZE 13       0.000
          MAJOR USES  14      -0.000 DEFLUORINATION MEDIUM
          MAJOR USES  15       0.000
          VOLATILITY  16       6.000 ALSO AVAILABLE AS 2% VOLATILE
     PARTICLE DENSITY 17       0.000
       MAX. OP. TEMP. 18       0.000
            ATTRITION 19       0.000
             COMMENTS 20      -0.000 ALSO USED AS CATALYST
```

```
MATERIAL CODE EN205                                          MATERIAL CODE EN205

       CLASSIFICATION  1      -0.000 CAT, ACTIVATED BAUXITE
          COMPOSITION  2      -0.000 AL203 88, SIO2 5, TIO2 3
     COST, 2CD ACTIVE  3     135.000 TIO2 3.0
      AVAILABLE SIZES  4      -0.000 5/16X5/16 INCH
     AVAILABLE SHAPES  5      -0.000 PELLETS
       CRUSH STRENGTH  6       0.000
             HARDNESS  7       0.000
            PORE SIZE  8       0.000
          PORE VOLUME  9       0.000
         SURFACE AREA 10     200.000
         BULK DENSITY 11      55.000
        CRYSTALLINITY 12       0.000
     CRYSTALLITE SIZE 13       0.000
          MAJOR USES  14      -0.000 SULFUR RECOVERY UNITS
          MAJOR USES  15       0.000
          VOLATILITY  16       8.000
     PARTICLE DENSITY 17       0.000
       MAX. OP. TEMP. 18       0.000
            ATTRITION 19       0.000
             COMMENTS 20       0.000
```

```
MATERIAL CODE EN206                                           MATERIAL CODE EN206

        CLASSIFICATION  1      -0.000 SOR, ACTIVATED BAUXITE
           COMPOSITION  2      -0.000 AL203 81.5, SIO2 10, TIO2 3.5
      COST, 2CD ACTIVE  3     250.000 TIO2 3.5
       AVAILABLE SIZES  4      -0.000 4/8, 4/10, 8/14 MESH
      AVAILABLE SHAPES  5       0.000
        CRUSH STRENGTH  6       0.000
              HARDNESS  7       0.000
             PORE SIZE  8       0.000
           PORE VOLUME  9       0.000
          SURFACE AREA 10     210.000
          BULK DENSITY 11      55.000
        CRYSTALLINITY 12        0.000
      CRYSTALLITE SIZE 13       0.000
            MAJOR USES 14      -0.000 DESSICANT FOR HYDROCARBONS,H2S
            MAJOR USES 15       0.000
            VOLATILITY 16       6.000
      PARTICLE DENSITY 17       0.000
        MAX. OP. TEMP. 18       0.000
             ATTRITION 19       0.000
              COMMENTS 20       0.000


MATERIAL CODE EN207                                           MATERIAL CODE EN207

        CLASSIFICATION  1      -0.000 SOR, ACTIVATED BAUXITE
           COMPOSITION  2      -0.000 NOT GIVEN
      COST, 2CD ACTIVE  3     250.000 NOT GIVEN
       AVAILABLE SIZES  4      -0.000 4/8, 8/14 MESH
      AVAILABLE SHAPES  5       0.000
        CRUSH STRENGTH  6       0.000
              HARDNESS  7       0.000
             PORE SIZE  8       0.000
           PORE VOLUME  9       0.000
          SURFACE AREA 10       0.000
          BULK DENSITY 11      59.000
         CRYSTALLINITY 12       0.000
      CRYSTALLITE SIZE 13       0.000
            MAJOR USES 14      -0.000 OVERCOME SOURING OF HYDROCBNS
            MAJOR USES 15      -0.000 DRYING HALOGENATED HYDROCBNS
            VOLATILITY 16       6.000
      PARTICLE DENSITY 17       0.000
        MAX. OP. TEMP. 18       0.000
             ATTRITION 19       0.000
              COMMENTS 20       0.000
```

```
MATERIAL CODE EN208                                   MATERIAL CODE EN208

      CLASSIFICATION  1       -0.000 CAT, REFORMING
         COMPOSITION  2       -0.000 AL2O3 81.5, FE2O3 3.5,TIO2 3.5
    COST, 2CD ACTIVE  3      122.500 FE2O3 3.5
     AVAILABLE SIZES  4       -0.000 4 TO 8 MESH
    AVAILABLE SHAPES  5       -0.000 GRANULAR
      CRUSH STRENGTH  6        0.000
            HARDNESS  7        0.000
           PORE SIZE  8        0.000
         PORE VOLUME  9        0.000
        SURFACE AREA 10      200.000
        BULK DENSITY 11       54.000
      CRYSTALLINITY  12        0.000
   CRYSTALLITE SIZE  13        0.000
          MAJOR USES 14       -0.000 REFORMING CAT FOR GASOLINE AND
          MAJOR USES 15       -0.000 NAPTHAS
          VOLATILITY 16        2.000 AT 1800 F
    PARTICLE DENSITY 17        0.000
     MAX. OP. TEMP.  18        0.000
           ATTRITION 19        0.000
            COMMENTS 20        0.000

MATERIAL CODE EP101                                   MATERIAL CODE EP101

      CLASSIFICATION  1       -0.000 CRR, SILICA, DIATOMACEOUS
         COMPOSITION  2       -0.000 AL2O3 92%,AL2O3 5%,FE2O3 1.8%
    COST, 2CD ACTIVE  3      230.000 FE2O3 1.8%
     AVAILABLE SIZES  4       -0.000 -1/2,+4 MESH
    AVAILABLE SHAPES  5        0.000
      CRUSH STRENGTH  6      200.000 LB./SQ.IN.,.THIS IS LOW.
            HARDNESS  7        0.000
           PORE SIZE  8        0.000
         PORE VOLUME  9        0.000
        SURFACE AREA 10       -0.000 SURFACE AREA EXTREMELY HIGH
        BULK DENSITY 11       23.000 DRY,LOOSE
       CRYSTALLINITY 12       -0.000 DIATOMACEOUS SILICA
    CRYSTALLITE SIZE 13        0.000
          MAJOR USES 14       -0.000 CARRIER FREE FROM POISONS
          MAJOR USES 15        0.000
          VOLATILITY 16        1.000 PER CENT ON IGNITION
    PARTICLE DENSITY 17        0.000
      MAX. OP. TEMP. 18        0.000
           ATTRITION 19        0.000
            COMMENTS 20       -0.000 FREE FROM CATALYTIC POISONS
```

```
MATERIAL CODE EP102                                          MATERIAL CODE EP102

          CLASSIFICATION  1        -0.000 CRR, SILICA, DIATOMACEOUS
             COMPOSITION  2        -0.000 SIO2 92, AL203 5, FE203 1.8
        COST, 2CD ACTIVE  3       230.000 FE203 1.8
         AVAILABLE SIZES  4        -0.000 10 MESH
        AVAILABLE SHAPES  5         0.000
          CRUSH STRENGTH  6       200.000 LBS/SQ. IN.
                HARDNESS  7         0.000
               PORE SIZE  8         0.000
             PORE VOLUME  9         0.000
            SURFACE AREA 10         0.000
            BULK DENSITY 11         0.000
          CRYSTALLINITY 12        -0.000 DIATOMACEOUS SILICA
        CRYSTALLITE SIZE 13         0.000
              MAJOR USES 14        -0.000 CATALYST SUPPORT
              MAJOR USES 15         0.000
              VOLATILITY 16         1.000
        PARTICLE DENSITY 17         0.000
          MAX. OP. TEMP. 18         0.000
               ATTRITION 19         0.000
                COMMENTS 20         0.000


MATERIAL CODE GR101                                          MATERIAL CODE GR101

          CLASSIFICATION  1        -0.000 CAT, PLATINUM ON ALUMINA
             COMPOSITION  2         0.000 AL203 96.9%, NI 3%, PT 0.1%
        COST, 2CD ACTIVE  3     10100.000 NI 3%
         AVAILABLE SIZES  4         0.000 1/4X1/4,3/8X3/8 INCHES
        AVAILABLE SHAPES  5         0.000 TABLETS
          CRUSH STRENGTH  6         0.000 NOT .LT. 35 LBS DWL, 5% .LT.18
                HARDNESS  7         0.000
               PORE SIZE  8         0.000
             PORE VOLUME  9          .280 CCL4 PORE VOL AT 800A
            SURFACE AREA 10       212.000
            BULK DENSITY 11        55.000
          CRYSTALLINITY 12        -0.000 GAMMA AL203
        CRYSTALLITE SIZE 13        64.000 A
              MAJOR USES 14         0.000 DECOMP. OF HNO3 PLANT TAIL GAS
              MAJOR USES 15        -0.000 NOX REACT O2,CO,HYDROCARBONS
              VOLATILITY 16         0.000
        PARTICLE DENSITY 17         0.000
          MAX. OP. TEMP. 18      2500.000 SHORT TERM,MAXIMUM
               ATTRITION 19         0.000
                COMMENTS 20        -0.000 SULFUR IS POISON
```

```
MATERIAL CODE GR202                                              MATERIAL CODE GR202

        CLASSIFICATION  1      -0.000 SOR, ACTIVATED CARBON
           COMPOSITION  2      -0.000 NOT GIVEN
     COST, 2CD ACTIVE  3    1435.000 NONE
      AVAILABLE SIZES  4      -0.000 4X6 MESH,8X30 MESH
     AVAILABLE SHAPES  5      -0.000 GRANULES, PELLETS
       CRUSH STRENGTH  6       0.000
             HARDNESS  7      90.000 PER CENT
            PORE SIZE  8       0.000
          PORE VOLUME  9        .670
         SURFACE AREA 10     850.000
         BULK DENSITY 11      34.000
       CRYSTALLINITY 12       0.000
    CRYSTALLITE SIZE 13       0.000
           MAJOR USES 14      -0.000 DESULFURIZING GAS STREAMS
           MAJOR USES 15      -0.000 FIXED BED OPERATIONS
           VOLATILITY 16       0.000
     PARTICLE DENSITY 17       0.000
      MAX. OP. TEMP. 18     350.000
            ATTRITION 19       0.000
             COMMENTS 20       0.000

MATERIAL CODE GR301                                              MATERIAL CODE GR301

        CLASSIFICATION  1      -0.000 CAT, COBALT-MOLY ON AL203
           COMPOSITION  2      -0.000 NOT GIVEN
     COST, 2CD ACTIVE  3    2090.000 MO
      AVAILABLE SIZES  4       0.000 3/16,1/8 INCH
     AVAILABLE SHAPES  5       0.000 EXTRUSIONS
       CRUSH STRENGTH  6      -0.000 APPEARS TO BE VERY FRAGILE
             HARDNESS  7       0.000
            PORE SIZE  8       0.000
          PORE VOLUME  9       0.000
         SURFACE AREA 10       0.000
         BULK DENSITY 11       0.000
       CRYSTALLINITY 12       0.000
    CRYSTALLITE SIZE 13       0.000
           MAJOR USES 14      -0.000 HYDRODESULFURIZATION
           MAJOR USES 15       0.000 HYDRODENITRIFICATION
           VOLATILITY 16       0.000
     PARTICLE DENSITY 17       0.000
      MAX. OP. TEMP. 18     750.000 MAXIMUM
            ATTRITION 19       0.000
             COMMENTS 20       0.000 LIMITED DROPPING DISTANCE,2FT.
```

```
MATERIAL CODE GR401                                          MATERIAL CODE GR401

       CLASSIFICATION  1        -0.000 CAT, NICKEL
          COMPOSITION  2        -0.000 NI 15 TO 25% BALANCE-NOT GIVEN
     COST, 2CD ACTIVE  3      1840.000 NOT GIVEN
      AVAILABLE SIZES  4        -0.000 3/4X3/4 OR 5/8X5/8 INCH RINGS
     AVAILABLE SHAPES  5        -0.000 RASCHIG RINGS, TABLETS, PELLET
       CRUSH STRENGTH  6        90.000 FOR 5/8 IN. RINGS, SIDE AXIS
             HARDNESS  7         0.000
            PORE SIZE  8         0.000
          PORE VOLUME  9         0.000
         SURFACE AREA 10         0.000
         BULK DENSITY 11        52.000
        CRYSTALLINITY 12         0.000
     CRYSTALLITE SIZE 13         0.000
          MAJOR USES 14         -0.000 PRODUCTION OF H2, NH3, CH3OH
          MAJOR USES 15          0.000
           VOLATILITY 16         0.000
     PARTICLE DENSITY 17         0.000
       MAX. OP. TEMP. 18         0.000
            ATTRITION 19         0.000
             COMMENTS 20         0.000


MATERIAL CODE GR402                                          MATERIAL CODE GR402

       CLASSIFICATION  1        -0.000 CAT, NICKEL
          COMPOSITION  2        -0.000 NOT GIVEN
     COST, 2CD ACTIVE  3      1840.000 NOT GIVEN
      AVAILABLE SIZES  4        -0.000 1/2 TO 3/4 INCH
     AVAILABLE SHAPES  5        -0.000 CYLINDERS, RASCHIG RINGS
       CRUSH STRENGTH  6         0.000
             HARDNESS  7         0.000
            PORE SIZE  8         0.000
          PORE VOLUME  9         0.000
         SURFACE AREA 10         0.000
         BULK DENSITY 11         0.000
        CRYSTALLINITY 12         0.000
     CRYSTALLITE SIZE 13         0.000
           MAJOR USES 14        -0.000 STEAM-HYDROCARBON REFORMING
           MAJOR USES 15         0.000
           VOLATILITY 16         0.000
     PARTICLE DENSITY 17         0.000
       MAX. OP. TEMP. 18      1850.000
            ATTRITION 19         0.000
             COMMENTS 20         0.000
```

```
MATERIAL CODE GR403                                   MATERIAL CODE GR403

      CLASSIFICATION  1       -0.000 CAT, NICKEL ON ALUMINA
         COMPOSITION  2       -0.000 NOT GIVEN
    COST, 2CD ACTIVE  3     1700.000 NOT GIVEN
     AVAILABLE SIZES  4       -0.000 5/8 TO 1-1/2 INCH
    AVAILABLE SHAPES  5       -0.000 IRREGULAR LUMPS
      CRUSH STRENGTH  6        0.000
            HARDNESS  7        0.000
           PORE SIZE  8        0.000
         PORE VOLUME  9        0.000
        SURFACE AREA 10        0.000
        BULK DENSITY 11        0.000
      CRYSTALLINITY 12        0.000
    CRYSTALLITE SIZE 13        0.000
         MAJOR USES 14       -0.000 STEAM-HYDROCARBON REFORMING
         MAJOR USES 15        0.000
         VOLATILITY 16        0.000
    PARTICLE DENSITY 17        0.000
      MAX. OP. TEMP. 18     2200.000
          ATTRITION 19        0.000
           COMMENTS 20        0.000

MATERIAL CODE GR404                                   MATERIAL CODE GR404

      CLASSIFICATION  1       -0.000 CAT, CHROMIUM-IRON OXIDE
         COMPOSITION  2       -0.000 NOT GIVEN
    COST, 2CD ACTIVE  3      572.000 NOT GIVEN
     AVAILABLE SIZES  4       -0.000 3/8X3/8 AND 1/4X1/4 INCH
    AVAILABLE SHAPES  5       -0.000 TABLETS
      CRUSH STRENGTH  6        0.000
            HARDNESS  7        0.000
           PORE SIZE  8        0.000
         PORE VOLUME  9        0.000
        SURFACE AREA 10        0.000
        BULK DENSITY 11        0.000
      CRYSTALLINITY 12        0.000
    CRYSTALLITE SIZE 13        0.000
         MAJOR USES 14       -0.000 WATER-GAS SHIFT REACTION
         MAJOR USES 15       -0.000 REMOVAL OF S2 FROM GAS STREAMS
         VOLATILITY 16        0.000
    PARTICLE DENSITY 17        0.000
      MAX. OP. TEMP. 18      890.000
          ATTRITION 19        0.000
           COMMENTS 20        0.000
```

```
MATERIAL CODE GR405                                        MATERIAL CODE GR405

      CLASSIFICATION  1       -0.000 CAT, COPPER OXIDE-ALUMINA
         COMPOSITION  2        0.000 CUO, AMOUNT NOT SPECIFIED
    COST, 2CD ACTIVE  3     1650.000 NONE
     AVAILABLE SIZES  4       -0.000 1/4X1/8, 3/16X3/16 INCH
    AVAILABLE SHAPES  5       -0.000 TABLETS
      CRUSH STRENGTH  6        0.000
            HARDNESS  7        0.000
           PORE SIZE  8        0.000
         PORE VOLUME  9        0.000
        SURFACE AREA 10        0.000
        BULK DENSITY 11       80.000
      CRYSTALLINITY 12        0.000
     CRYSTALLITE SIZE 13       0.000
          MAJOR USES 14       -0.000 LOW TEMP. CO CONVERSION
          MAJOR USES 15        0.000
          VOLATILITY 16        0.000
    PARTICLE DENSITY 17        0.000
      MAX. OP. TEMP. 18      375.000
           ATTRITION 19        0.000
            COMMENTS 20       -0.000 POISONED BY S2, HALOGEN COMPS
```

```
MATERIAL CODE GR406                                        MATERIAL CODE GR406

      CLASSIFICATION  1       -0.000 CAT, NICKEL
         COMPOSITION  2       -0.000 NI 32% BALANCE-NOT GIVEN
    COST, 2CD ACTIVE  3     2700.000 NOT GIVEN
     AVAILABLE SIZES  4       -0.000 1/4X1/4 INCH
    AVAILABLE SHAPES  5       -0.000 PELLETS
      CRUSH STRENGTH  6        0.000
            HARDNESS  7        0.000
           PORE SIZE  8        0.000
         PORE VOLUME  9        0.000
        SURFACE AREA 10        0.000
        BULK DENSITY 11       65.000
      CRYSTALLINITY 12        0.000
     CRYSTALLITE SIZE 13       0.000
          MAJOR USES 14       -0.000 METHANATION REACTIONS
          MAJOR USES 15        0.000
          VOLATILITY 16        0.000
    PARTICLE DENSITY 17        0.000
      MAX. OP. TEMP. 18     1500.000
           ATTRITION 19        0.000
            COMMENTS 20        0.000
```

MATERIAL CODE GR407

MATERIAL CODE GR407

```
    CLASSIFICATION  1        -0.000 CAT, NICKEL
       COMPOSITION  2        -0.000 NI 32% BALANCE-NOT GIVEN
  COST, 2CD ACTIVE  3      1920.000 NOT GIVEN
   AVAILABLE SIZES  4        -0.000 1/4X1/4 INCH
  AVAILABLE SHAPES  5        -0.000 TABLETS
    CRUSH STRENGTH  6         0.000
          HARDNESS  7         0.000
         PORE SIZE  8         0.000
       PORE VOLUME  9         0.000
      SURFACE AREA 10         0.000
      BULK DENSITY 11        65.000
    CRYSTALLINITY  12         0.000
  CRYSTALLITE SIZE 13         0.000
        MAJOR USES 14        -0.000 METHANATION REACTIONS
        MAJOR USES 15         0.000
        VOLATILITY 16         0.000
  PARTICLE DENSITY 17         0.000
    MAX. OP. TEMP. 18       825.000
         ATTRITION 19         0.000
          COMMENTS 20         0.000
```

MATERIAL CODE GR409

MATERIAL CODE GR409

```
    CLASSIFICATION  1        -0.000 CAT, CO-MO ON ALUMINA
       COMPOSITION  2        -0.000 NOT GIVEN
  COST, 2CD ACTIVE  3      2700.000 NOT GIVEN
   AVAILABLE SIZES  4        -0.000 3/16X3/16 INCH
  AVAILABLE SHAPES  5        -0.000 TABLETS
    CRUSH STRENGTH  6         0.000
          HARDNESS  7         0.000
         PORE SIZE  8         0.000
       PORE VOLUME  9         0.000
      SURFACE AREA 10         0.000
      BULK DENSITY 11         0.000
    CRYSTALLINITY  12         0.000
  CRYSTALLITE SIZE 13         0.000
        MAJOR USES 14        -0.000 HYDRODESULFURIZATION
        MAJOR USES 15         0.000
        VOLATILITY 16         0.000
  PARTICLE DENSITY 17         0.000
    MAX. OP. TEMP. 18         0.000
         ATTRITION 19         0.000
          COMMENTS 20         0.000
```

```
MATERIAL CODE GR411                                      MATERIAL CODE GR411

       CLASSIFICATION  1       -0.000 CAT, CHROMIA-ALUMINA
          COMPOSITION  2       -0.000 NOT GIVEN
      COST, 2CD ACTIVE  3    2200.000 NOT GIVEN
      AVAILABLE SIZES  4       -0.000 3/16X3/16, 1/4X1/4 INCH
     AVAILABLE SHAPES  5       -0.000 TABLETS
       CRUSH STRENGTH  6        0.000
             HARDNESS  7        0.000
            PORE SIZE  8        0.000
          PORE VOLUME  9        0.000
         SURFACE AREA 10        0.000
         BULK DENSITY 11        0.000
        CRYSTALLINITY 12        0.000
     CRYSTALLITE SIZE 13        0.000
           MAJOR USES 14       -0.000 REMOVAL OF S2 COMPDS FROM GAS
           MAJOR USES 15        0.000
           VOLATILITY 16        0.000
     PARTICLE DENSITY 17        0.000
       MAX. OP. TEMP. 18      850.000
            ATTRITION 19        0.000
             COMMENTS 20        0.000

MATERIAL CODE GR412                                      MATERIAL CODE GR412

       CLASSIFICATION  1       -0.000 CAT, IRON OXIDE
          COMPOSITION  2       -0.000 NOT GIVEN
      COST, 2CD ACTIVE  3        0.000 NOT GIVEN
      AVAILABLE SIZES  4       -0.000 1/4X1/4 INCH
     AVAILABLE SHAPES  5       -0.000 TABLETS
       CRUSH STRENGTH  6        0.000
             HARDNESS  7        0.000
            PORE SIZE  8        0.000
          PORE VOLUME  9        0.000
         SURFACE AREA 10        0.000
         BULK DENSITY 11        0.000
        CRYSTALLINITY 12        0.000
     CRYSTALLITE SIZE 13        0.000
           MAJOR USES 14       -0.000 REMOVAL OF S2 COMPDS FROM GAS
           MAJOR USES 15        0.000
           VOLATILITY 16        0.000
     PARTICLE DENSITY 17        0.000
       MAX. OP. TEMP. 18        0.000
            ATTRITION 19        0.000
             COMMENTS 20        0.000
```

```
MATERIAL CODE GR413                                      MATERIAL CODE GR413

       CLASSIFICATION  1       -0.000 SOR, ZINC OXIDE
          COMPOSITION  2       -0.000 NOT GIVEN
     COST, 2CD ACTIVE  3     1167.000 NOT GIVEN
      AVAILABLE SIZES  4       -0.000 1/8 TO 3/16 INCH
     AVAILABLE SHAPES  5       -0.000 SPHERICAL PILLS
       CRUSH STRENGTH  6        0.000
             HARDNESS  7        0.000
            PORE SIZE  8        0.000
          PORE VOLUME  9        0.000
         SURFACE AREA 10        0.000
         BULK DENSITY 11       75.000
       CRYSTALLINITY  12        0.000
    CRYSTALLITE SIZE  13        0.000
          MAJOR USES  14       -0.000 REMOVES H2S FROM GAS STREAMS
          MAJOR USES  15        0.000
          VOLATILITY  16        0.000
    PARTICLE DENSITY  17        0.000
      MAX. OP. TEMP.  18      840.000
           ATTRITION  19        0.000
            COMMENTS  20        0.000

MATERIAL CODE GR414                                      MATERIAL CODE GR414

       CLASSIFICATION  1       -0.000 CAT, CO-MO
          COMPOSITION  2       -0.000 NOT GIVEN
     COST, 2CD ACTIVE  3     2090.000 NOT GIVEN
      AVAILABLE SIZES  4       -0.000 3/16X3/16 INCH
     AVAILABLE SHAPES  5       -0.000 TABLETS
       CRUSH STRENGTH  6        0.000
             HARDNESS  7        0.000
            PORE SIZE  8        0.000
          PORE VOLUME  9        0.000
         SURFACE AREA 10        0.000
         BULK DENSITY 11        0.000
       CRYSTALLINITY  12        0.000
    CRYSTALLITE SIZE  13        0.000
          MAJOR USES  14       -0.000 CONVERT S2 COMPDS TO H2S
          MAJOR USES  15       -0.000 HYDROGENATION OF OLEFINS
          VOLATILITY  16        0.000
    PARTICLE DENSITY  17        0.000
      MAX. OP. TEMP.  18        0.000
           ATTRITION  19        0.000
            COMMENTS  20        0.000
```

```
MATERIAL CODE GR415                                        MATERIAL CODE GR415

      CLASSIFICATION  1       -0.000 CAT, PD ON REFRACTORY OXIDE
         COMPOSITION  2       -0.000 PD 0.05-0.4% REFRACT OXIDE-BAL
    COST, 2CD ACTIVE  3    10800.000 NONE
     AVAILABLE SIZES  4       -0.000 3/16X3/16 INCH
    AVAILABLE SHAPES  5       -0.000 TABLETS
      CRUSH STRENGTH  6        0.000
            HARDNESS  7        0.000
           PORE SIZE  8        0.000
         PORE VOLUME  9        0.000
        SURFACE AREA 10        0.000
        BULK DENSITY 11        0.000
       CRYSTALLINITY 12        0.000
    CRYSTALLITE SIZE 13        0.000
         MAJOR USES 14       -0.000 HYDROGENATION
         MAJOR USES 15        0.000
          VOLATILITY 16        0.000
    PARTICLE DENSITY 17        0.000
      MAX. OP. TEMP. 18        0.000
           ATTRITION 19        0.000
            COMMENTS 20        0.000


MATERIAL CODE GR416                                        MATERIAL CODE GR416

      CLASSIFICATION  1       -0.000 CAT, PD ON ACTIVATED ALUMINA
         COMPOSITION  2       -0.000 NOT GIVEN
    COST, 2CD ACTIVE  3    11800.000 NOT GIVEN
     AVAILABLE SIZES  4       -0.000 3/16X3/16 INCH
    AVAILABLE SHAPES  5       -0.000 TABLETS
      CRUSH STRENGTH  6        0.000
            HARDNESS  7        0.000
           PORE SIZE  8        0.000
         PORE VOLUME  9        0.000
        SURFACE AREA 10        0.000
        BULK DENSITY 11        0.000
       CRYSTALLINITY 12        0.000
    CRYSTALLITE SIZE 13        0.000
          MAJOR USES 14       -0.000 REMOVAL OF O2 FROM H2 STREAMS
          MAJOR USES 15        0.000
          VOLATILITY 16        0.000
    PARTICLE DENSITY 17        0.000
      MAX. OP. TEMP. 18        0.000
           ATTRITION 19        0.000
            COMMENTS 20        0.000
```

```
MATERIAL CODE GR417                                       MATERIAL CODE GR417

     CLASSIFICATION  1       -0.000 CAT, PD ON ACTIVATED CARBON
        COMPOSITION  2       -0.000 NOT GIVEN
   COST, 2CD ACTIVE  3    12000.000 NOT GIVEN
    AVAILABLE SIZES  4       -0.000 4X8 MESH
   AVAILABLE SHAPES  5       -0.000 GRANULES
     CRUSH STRENGTH  6        0.000
           HARDNESS  7        0.000
          PORE SIZE  8        0.000
        PORE VOLUME  9        0.000
       SURFACE AREA 10        0.000
       BULK DENSITY 11        0.000
      CRYSTALLINITY 12        0.000
   CRYSTALLITE SIZE 13        0.000
         MAJOR USES 14       -0.000 REMOVAL OF O2 FROM H2 STREAMS
         MAJOR USES 15        0.000
         VOLATILITY 16        0.000
   PARTICLE DENSITY 17        0.000
     MAX. OP. TEMP. 18        0.000
          ATTRITION 19        0.000
           COMMENTS 20        0.000


MATERIAL CODE GR419                                       MATERIAL CODE GR419

     CLASSIFICATION  1       -0.000 CAT, NI-CO PROMOTED
        COMPOSITION  2       -0.000 NOT GIVEN
   COST, 2CD ACTIVE  3     1270.000 NOT GIVEN
    AVAILABLE SIZES  4       -0.000 1/4 INCH
   AVAILABLE SHAPES  5       -0.000 EXTRUSIONS
     CRUSH STRENGTH  6        0.000
           HARDNESS  7        0.000
          PORE SIZE  8        0.000
        PORE VOLUME  9        0.000
       SURFACE AREA 10        0.000
       BULK DENSITY 11        0.000
      CRYSTALLINITY 12        0.000
   CRYSTALLITE SIZE 13        0.000
         MAJOR USES 14       -0.000 SELECTIVE HYDROGENATION
         MAJOR USES 15        0.000
         VOLATILITY 16        0.000
   PARTICLE DENSITY 17        0.000
     MAX. OP. TEMP. 18        0.000
          ATTRITION 19        0.000
           COMMENTS 20        0.000
```

```
  MATERIAL CODE GR420                                             MATERIAL CODE GR420

          CLASSIFICATION  1        -0.000 CAT, PALLADIUM ON ALUMINA
             COMPOSITION  2        -0.000 NOT GIVEN
        COST, 2CD ACTIVE  3      2090.000 NOT GIVEN
         AVAILABLE SIZES  4        -0.000 3/16X3/16 INCH
        AVAILABLE SHAPES  5        -0.000 PELLETS
          CRUSH STRENGTH  6         0.000
                HARDNESS  7         0.000
               PORE SIZE  8         0.000
             PORE VOLUME  9         0.000
            SURFACE AREA 10         0.000
            BULK DENSITY 11        80.000
          CRYSTALLINITY 12         0.000
        CRYSTALLITE SIZE 13         0.000
              MAJOR USES 14        -0.000 SELECTIVE HYDROGENATION
              MAJOR USES 15         0.000
              VOLATILITY 16         0.000
        PARTICLE DENSITY 17         0.000
           MAX. OP. TEMP. 18      350.000
               ATTRITION 19         0.000
                COMMENTS 20         0.000


  MATERIAL CODE GR421                                             MATERIAL CODE GR421

          CLASSIFICATION  1        -0.000 CAT, PALLADIUM ON ALUMINA
             COMPOSITION  2        -0.000 NOT GIVEN
        COST, 2CD ACTIVE  3      2090.000 NOT GIVEN
         AVAILABLE SIZES  4        -0.000 3/16X3/16 INCH
        AVAILABLE SHAPES  5        -0.000 PELLETS
          CRUSH STRENGTH  6         0.000
                HARDNESS  7         0.000
               PORE SIZE  8         0.000
             PORE VOLUME  9         0.000
            SURFACE AREA 10         0.000
            BULK DENSITY 11        58.000
          CRYSTALLINITY 12         0.000
        CRYSTALLITE SIZE 13         0.000
              MAJOR USES 14        -0.000 SELECTIVE HYDROGENATION
              MAJOR USES 15         0.000
              VOLATILITY 16         0.000
        PARTICLE DENSITY 17         0.000
           MAX. OP. TEMP. 18      350.000
               ATTRITION 19         0.000
                COMMENTS 20         0.000
```

```
MATERIAL CODE GR422                                   MATERIAL CODE GR422

      CLASSIFICATION  1       -0.000 CAT, PALLADIUM ON ALUMINA
         COMPOSITION  2       -0.000 NOT GIVEN
     COST, 2CD ACTIVE 3    12700.000 NOT GIVEN
      AVAILABLE SIZES 4       -0.000 3/16X3/16, 3/16X3/8 INCH
     AVAILABLE SHAPES 5       -0.000 PELLETS
      CRUSH STRENGTH  6       45.000 FOR 3/16X3/16 PELLETS
            HARDNESS  7        0.000
           PORE SIZE  8        0.000
         PORE VOLUME  9        0.000
        SURFACE AREA 10        0.000
        BULK DENSITY 11       67.000
      CRYSTALLINITY  12        0.000
    CRYSTALLITE SIZE 13        0.000
          MAJOR USES 14       -0.000 SELECTIVE HYDROGENATION
          MAJOR USES 15        0.000
          VOLATILITY 16        0.000
    PARTICLE DENSITY 17        0.000
      MAX. OP. TEMP. 18      350.000
           ATTRITION 19        0.000
            COMMENTS 20       -0.000 POISONED BY SULFUR
```

```
MATERIAL CODE GR424                                   MATERIAL CODE GR424

      CLASSIFICATION  1       -0.000 CAT, CO-MO
         COMPOSITION  2       -0.000 NOT GIVEN
     COST, 2CD ACTIVE 3        0.000 NOT GIVEN
      AVAILABLE SIZES 4       -0.000 1/4X1/4, 1/2X1/2 INCH
     AVAILABLE SHAPES 5       -0.000 TABLETS
      CRUSH STRENGTH  6        0.000
            HARDNESS  7        0.000
           PORE SIZE  8        0.000
         PORE VOLUME  9        0.000
        SURFACE AREA 10        0.000
        BULK DENSITY 11        0.000
       CRYSTALLINITY 12        0.000
    CRYSTALLITE SIZE 13        0.000
          MAJOR USES 14       -0.000 SELECTIVE HYDROGENATION
          MAJOR USES 15        0.000
          VOLATILITY 16        0.000
    PARTICLE DENSITY 17        0.000
      MAX. OP. TEMP. 18        0.000
           ATTRITION 19        0.000
            COMMENTS 20        0.000
```

```
MATERIAL CODE GR425                                          MATERIAL CODE GR425

       CLASSIFICATION  1        -0.000 CAT, PROMOTED COBALT
          COMPOSITION  2        -0.000 CO 60% IN OXIDIZED FORM
     COST, 2CD ACTIVE  3      8500.000 NONE
      AVAILABLE SIZES  4        -0.000 3/16X1/8, 1/4X3/16 INCH
     AVAILABLE SHAPES  5        -0.000 PELLETS
       CRUSH STRENGTH  6        15.000 FOR 3/16X1/8 PELLETS
             HARDNESS  7         0.000
            PORE SIZE  8         0.000
          PORE VOLUME  9         0.000
         SURFACE AREA 10         0.000
         BULK DENSITY 11        75.000
       CRYSTALLINITY 12          0.000
    CRYSTALLITE SIZE 13          0.000
           MAJOR USES 14        -0.000 PRODUCTION OF PRIMARY AMINES
           MAJOR USES 15        -0.000 HYDROGENATION
           VOLATILITY 16         0.000
     PARTICLE DENSITY 17         0.000
      MAX. OP. TEMP. 18        750.000
            ATTRITION 19         0.000
             COMMENTS 20         0.000

MATERIAL CODE GR426                                          MATERIAL CODE GR426

       CLASSIFICATION  1        -0.000 CAT, CO ON REFRACTORY OXIDE
          COMPOSITION  2        -0.000 CO 33%, REFRACTORY OXIDE-BAL.
     COST, 2CD ACTIVE  3      4500.000 NONE
      AVAILABLE SIZES  4        -0.000 1/4X1/4 INCH
     AVAILABLE SHAPES  5        -0.000 TABLETS
       CRUSH STRENGTH  6         0.000
             HARDNESS  7         0.000
            PORE SIZE  8         0.000
          PORE VOLUME  9         0.000
         SURFACE AREA 10         0.000
         BULK DENSITY 11         0.000
       CRYSTALLINITY 12          0.000
    CRYSTALLITE SIZE 13          0.000
           MAJOR USES 14        -0.000 HYDROGENATION
           MAJOR USES 15         0.000
           VOLATILITY 16         0.000
     PARTICLE DENSITY 17         0.000
      MAX. OP. TEMP. 18          0.000
            ATTRITION 19         0.000
             COMMENTS 20         0.000
```

```
MATERIAL CODE GR427                                    MATERIAL CODE GR427

      CLASSIFICATION  1      -0.000 CAT, CO ON KIESELGUHR
         COMPOSITION  2      -0.000 NOT GIVEN
    COST, 2CD ACTIVE  3    8000.000 NOT GIVEN
     AVAILABLE SIZES  4      -0.000 3/16X1/8 INCH
    AVAILABLE SHAPES  5      -0.000 POWDER, TABLETS
      CRUSH STRENGTH  6       0.000
            HARDNESS  7       0.000
           PORE SIZE  8       0.000
         PORE VOLUME  9       0.000
        SURFACE AREA 10       0.000
        BULK DENSITY 11       0.000
       CRYSTALLINITY 12       0.000
    CRYSTALLITE SIZE 13       0.000
          MAJOR USES 14      -0.000 HYDROGENATION
          MAJOR USES 15       0.000
          VOLATILITY 16       0.000
    PARTICLE DENSITY 17       0.000
      MAX. OP. TEMP. 18       0.000
           ATTRITION 19       0.000
            COMMENTS 20       0.000

MATERIAL CODE GR428                                    MATERIAL CODE GR428

      CLASSIFICATION  1      -0.000 CAT,COPPER-CHROMITE
         COMPOSITION  2      -0.000 NOT GIVEN
    COST, 2CD ACTIVE  3    3700.000 NOT GIVEN
     AVAILABLE SIZES  4      -0.000 3/16X3/16 INCH
    AVAILABLE SHAPES  5      -0.000 POWDER, TABLETS
      CRUSH STRENGTH  6       0.000
            HARDNESS  7       0.000
           PORE SIZE  8       0.000
         PORE VOLUME  9       0.000
        SURFACE AREA 10       0.000
        BULK DENSITY 11       0.000
       CRYSTALLINITY 12       0.000
    CRYSTALLITE SIZE 13       0.000
          MAJOR USES 14      -0.000 MILD HYDROGENATION
          MAJOR USES 15       0.000
          VOLATILITY 16       0.000
    PARTICLE DENSITY 17       0.000
      MAX. OP. TEMP. 18       0.000
           ATTRITION 19       0.000
            COMMENTS 20       0.000
```

```
MATERIAL CODE GR429                                          MATERIAL CODE GR429

       CLASSIFICATION  1        -0.000 CAT, BA PROMOTED CU2CR204
          COMPOSITION  2        -0.000 NOT GIVEN
     COST, 2CD ACTIVE  3      3700.000 BARIUM
      AVAILABLE SIZES  4         0.000
     AVAILABLE SHAPES  5         0.000
       CRUSH STRENGTH  6         0.000
             HARDNESS  7         0.000
            PORE SIZE  8         0.000
          PORE VOLUME  9         0.000
         SURFACE AREA 10         0.000
         BULK DENSITY 11         0.000
       CRYSTALLINITY 12         0.000
     CRYSTALLITE SIZE 13         0.000
           MAJOR USES 14         0.000
           MAJOR USES 15         0.000
           VOLATILITY 16         0.000
     PARTICLE DENSITY 17         0.000
       MAX. OP. TEMP. 18         0.000
            ATTRITION 19         0.000
             COMMENTS 20         0.000

MATERIAL CODE GR430                                          MATERIAL CODE GR430

       CLASSIFICATION  1        -0.000 CAT, NICKEL ON KIESELGUHR
          COMPOSITION  2        -0.000 NI 65%,BALANCE KIESELGUHR
     COST, 2CD ACTIVE  3      5500.000 NONE
      AVAILABLE SIZES  4        -0.000 3/16X1/8 INCH
     AVAILABLE SHAPES  5        -0.000 TABLETS, POWDER
       CRUSH STRENGTH  6         0.000
             HARDNESS  7         0.000
            PORE SIZE  8         0.000
          PORE VOLUME  9          .290
         SURFACE AREA 10       155.000 TABLETS
         BULK DENSITY 11        60.000 TABLETS
        CRYSTALLINITY 12         0.000
     CRYSTALLITE SIZE 13         0.000
           MAJOR USES 14        -0.000 HYDROGENATION
           MAJOR USES 15         0.000
           VOLATILITY 16         0.000
     PARTICLE DENSITY 17         0.000
       MAX. OP. TEMP. 18         0.000
            ATTRITION 19         0.000
             COMMENTS 20         0.000
```

```
MATERIAL CODE GR431                                   MATERIAL CODE GR431

        CLASSIFICATION  1       -0.000 CAT, NICKEL ON KIESELGUHR
           COMPOSITION  2       -0.000 NI 54%, ZR 2%
      COST, 2CD ACTIVE  3     6200.000 ZR 3.0
       AVAILABLE SIZES  4       -0.000 3/16X1/8 INCH
      AVAILABLE SHAPES  5       -0.000 TABLETS, POWDER
        CRUSH STRENGTH  6        0.000
              HARDNESS  7        0.000
             PORE SIZE  8        0.000
           PORE VOLUME  9         .200
          SURFACE AREA 10      274.000 TABLETS
          BULK DENSITY 11       60.000 TABLETS
         CRYSTALLINITY 12        0.000
      CRYSTALLITE SIZE 13        0.000
           MAJOR USES  14       -0.000 HYDROGENATION
           MAJOR USES  15        0.000
            VOLATILITY 16        0.000
      PARTICLE DENSITY 17        0.000
        MAX. OP. TEMP. 18        0.000
             ATTRITION 19        0.000
              COMMENTS 20        0.000


MATERIAL CODE GR432                                   MATERIAL CODE GR432

        CLASSIFICATION  1       -0.000 CAT, ZR PROMOTED NI
           COMPOSITION  2       -0.000 NI 33%, BALANCE-NOT GIVEN
      COST, 2CD ACTIVE  3     3000.000 ZR
       AVAILABLE SIZES  4       -0.000 1/4X1/4 INCH
      AVAILABLE SHAPES  5       -0.000 TABLETS
        CRUSH STRENGTH  6        0.000
              HARDNESS  7        0.000
             PORE SIZE  8        0.000
           PORE VOLUME  9        0.000
          SURFACE AREA 10        0.000
          BULK DENSITY 11        0.000
         CRYSTALLINITY 12        0.000
      CRYSTALLITE SIZE 13        0.000
           MAJOR USES  14       -0.000 HYDROGENATION
           MAJOR USES  15        0.000
            VOLATILITY 16        0.000
      PARTICLE DENSITY 17        0.000
        MAX. OP. TEMP. 18        0.000
             ATTRITION 19        0.000
              COMMENTS 20        0.000
```

```
MATERIAL CODE GR433                                          MATERIAL CODE GR433

      CLASSIFICATION  1        -0.000 CAT, PALLADIUM ON CARBON
         COMPOSITION  2        -0.000 PD 1 TO 10%, CARBON BALANCE
    COST, 2CD ACTIVE  3     49400.000 NONE
     AVAILABLE SIZES  4        -0.000 95% THROUGH 100 MESH
    AVAILABLE SHAPES  5        -0.000 POWDER, WET CAKES
      CRUSH STRENGTH  6         0.000
            HARDNESS  7         0.000
           PORE SIZE  8         0.000
         PORE VOLUME  9         0.000
        SURFACE AREA 10         0.000
        BULK DENSITY 11        26.000
       CRYSTALLINITY 12         0.000
    CRYSTALLITE SIZE 13         0.000
          MAJOR USES 14        -0.000 SLURRY-TYPE HYDROGENATION
          MAJOR USES 15         0.000
          VOLATILITY 16         0.000
    PARTICLE DENSITY 17         0.000
      MAX. OP. TEMP. 18         0.000
           ATTRITION 19         0.000
            COMMENTS 20         0.000


MATERIAL CODE GR434                                          MATERIAL CODE GR434

      CLASSIFICATION  1        -0.000 CAT, PALLADIUM ON CARBON
         COMPOSITION  2        -0.000 PD 1 TO 10%, CARBON BALANCE
    COST, 2CD ACTIVE  3     49400.000 NONE
     AVAILABLE SIZES  4        -0.000 95% THROUGH 100 MESH
    AVAILABLE SHAPES  5        -0.000 POWDER, WET CAKES
      CRUSH STRENGTH  6         0.000
            HARDNESS  7         0.000
           PORE SIZE  8         0.000
         PORE VOLUME  9         0.000
        SURFACE AREA 10         0.000
        BULK DENSITY 11        26.000
       CRYSTALLINITY 12         0.000
    CRYSTALLITE SIZE 13         0.000
          MAJOR USES 14        -0.000 SLURRY-TYPE HYDROGENATION
          MAJOR USES 15         0.000
          VOLATILITY 16         0.000
    PARTICLE DENSITY 17         0.000
      MAX. OP. TEMP. 18         0.000
           ATTRITION 19         0.000
            COMMENTS 20        -0.000 MANUFACTURING NOT EQ. TO GR433
```

```
MATERIAL CODE GR435                                          MATERIAL CODE GR435

        CLASSIFICATION  1      -0.000 CAT, IRON OXIDE
           COMPOSITION  2      -0.000 NOT GIVEN
      COST, 2CD ACTIVE  3       0.000 NOT GIVEN
       AVAILABLE SIZES  4      -0.000 2-8 MM
      AVAILABLE SHAPES  5      -0.000 GRANULES
        CRUSH STRENGTH  6       0.000
              HARDNESS  7       0.000
             PORE SIZE  8       0.000
           PORE VOLUME  9       0.000
          SURFACE AREA 10       0.000
          BULK DENSITY 11       0.000
         CRYSTALLINITY 12       0.000
      CRYSTALLITE SIZE 13       0.000
            MAJOR USES 14      -0.000 AMMONIA SYNTHESIS
            MAJOR USES 15       0.000
            VOLATILITY 16       0.000
      PARTICLE DENSITY 17       0.000
      MAX. OP. TEMP.   18       0.000
             ATTRITION 19       0.000
              COMMENTS 20       0.000

MATERIAL CODE GR436                                          MATERIAL CODE GR436

        CLASSIFICATION  1      -0.000 CAT, IRON OXIDE
           COMPOSITION  2      -0.000 NOT GIVEN
      COST, 2CD ACTIVE  3    2400.000 NOT GIVEN
       AVAILABLE SIZES  4      -0.000 1/4, 1/2, 3/4, 1-INCH
      AVAILABLE SHAPES  5      -0.000 SPHERES
        CRUSH STRENGTH  6       0.000
              HARDNESS  7       0.000
             PORE SIZE  8       0.000
           PORE VOLUME  9       0.000
          SURFACE AREA 10       0.000
          BULK DENSITY 11       0.000
         CRYSTALLINITY 12       0.000
      CRYSTALLITE SIZE 13       0.000
            MAJOR USES 14      -0.000 AMMONIA DISSOCIATION
            MAJOR USES 15       0.000
            VOLATILITY 16       0.000
      PARTICLE DENSITY 17       0.000
      MAX. OP. TEMP.   18    1850.000
             ATTRITION 19       0.000
              COMMENTS 20       0.000
```

```
MATERIAL CODE GR437                                              MATERIAL CODE GR437

     CLASSIFICATION  1       -0.000 CAT, IRON OXIDE
        COMPOSITION  2       -0.000 NOT GIVEN
    COST, 2CD ACTIVE  3     817.000 NOT GIVEN
     AVAILABLE SIZES  4      -0.000 1/16, 1/8 INCH
    AVAILABLE SHAPES  5      -0.000 EXTRUSIONS
      CRUSH STRENGTH  6       0.000
            HARDNESS  7       0.000
           PORE SIZE  8       0.000
         PORE VOLUME  9       0.000
        SURFACE AREA 10       0.000
        BULK DENSITY 11       0.000
       CRYSTALLINITY 12       0.000
    CRYSTALLITE SIZE 13       0.000
          MAJOR USES 14      -0.000 DEHYDROGENATION
          MAJOR USES 15       0.000
          VOLATILITY 16       0.000
    PARTICLE DENSITY 17       0.000
      MAX. OP. TEMP. 18       0.000
           ATTRITION 19       0.000
            COMMENTS 20       0.000

MATERIAL CODE GR438                                              MATERIAL CODE GR438

     CLASSIFICATION  1       -0.000 CAT, CR AND K PROMOTED IRON
        COMPOSITION  2       -0.000 NOT GIVEN
    COST, 2CD ACTIVE  3     817.000 NOT GIVEN
     AVAILABLE SIZES  4      -0.000 1/8 AND 3/16 INCH
    AVAILABLE SHAPES  5      -0.000 EXTRUSIONS
      CRUSH STRENGTH  6      20.000
            HARDNESS  7       0.000
           PORE SIZE  8       0.000
         PORE VOLUME  9       0.000
        SURFACE AREA 10       0.000
        BULK DENSITY 11      75.000
       CRYSTALLINITY 12       0.000
    CRYSTALLITE SIZE 13       0.000
          MAJOR USES 14      -0.000 STYRENE PRODUCTION FROM ETHYL-
          MAJOR USES 15      -0.000 BENZENE; DEHYDROGEN.OF CUMENE
          VOLATILITY 16       0.000
    PARTICLE DENSITY 17       0.000
      MAX. OP. TEMP. 18    1200.000
           ATTRITION 19       0.000
            COMMENTS 20       0.000
```

```
MATERIAL CODE GR439                                        MATERIAL CODE GR439

      CLASSIFICATION  1      -0.000 SOR, ACTIVATED CARBON
         COMPOSITION  2      -0.000 NOT GIVEN
    COST, 2CD ACTIVE  3    1320.000 NOT GIVEN
     AVAILABLE SIZES  4      -0.000 4X6, 8X30 MESH
    AVAILABLE SHAPES  5      -0.000 PELLETS, GRANULES
      CRUSH STRENGTH  6       0.000
            HARDNESS  7      90.000 %
           PORE SIZE  8       0.000
         PORE VOLUME  9        .670
        SURFACE AREA 10     800.000
        BULK DENSITY 11       0.000
      CRYSTALLINITY  12       0.000
    CRYSTALLITE SIZE 13       0.000
          MAJOR USES 14      -0.000 REMOVAL OF S2 COMPDS FROM GAS
          MAJOR USES 15       0.000
          VOLATILITY 16       0.000
    PARTICLE DENSITY 17       0.000
     MAX. OP. TEMP.  18       0.000
           ATTRITION 19       0.000
            COMMENTS 20       0.000
```

```
MATERIAL CODE GR440                                        MATERIAL CODE GR440

      CLASSIFICATION  1      -0.000 CAT, PALLADIUM ON SIO2-AL2O3
         COMPOSITION  2      -0.000 PD .05-.5,SIO2-AL2O3 BALANCE
    COST, 2CD ACTIVE  3   10800.000 NONE
     AVAILABLE SIZES  4      -0.000 3/16 INCH
    AVAILABLE SHAPES  5      -0.000 SPHERES
      CRUSH STRENGTH  6       0.000
            HARDNESS  7       0.000
           PORE SIZE  8       0.000
         PORE VOLUME  9       0.000
        SURFACE AREA 10       0.000
        BULK DENSITY 11      47.000
       CRYSTALLINITY 12       0.000
    CRYSTALLITE SIZE 13       0.000
          MAJOR USES 14      -0.000 HYDROGENATION
          MAJOR USES 15       0.000
          VOLATILITY 16       0.000
    PARTICLE DENSITY 17       0.000
     MAX. OP. TEMP.  18       0.000
           ATTRITION 19       0.000
            COMMENTS 20       0.000
```

```
                                                                    MATERIAL CODE HC201
MATERIAL CODE HC201

        CLASSIFICATION  1       -0.000 CAT, CHROME-ALUMINA
           COMPOSITION  2        0.000 CR203 17.5% MIN., AL203 BAL.
      COST, 2CD ACTIVE  3     2000.000 NONE
       AVAILABLE SIZES  4        0.000 1/8X1/6 INCHES
      AVAILABLE SHAPES  5       -0.000 PELLETS, CYLINDRICAL EXTRUSION
        CRUSH STRENGTH  6       15.000 MINIMUM
              HARDNESS  7        0.000
             PORE SIZE  8        0.000
           PORE VOLUME  9        0.000
          SURFACE AREA 10       45.000 MIN.  70. MAX.
          BULK DENSITY 11       60.000 MIN. 69 MAX.
        CRYSTALLINITY 12         0.000
     CRYSTALLITE SIZE 13         0.000
           MAJOR USES 14         0.000 DEHYDROGENATION; HYDROCRACKING
           MAJOR USES 15         0.000 AROMATIZATION
           VOLATILITY 16         2.000 1400F
     PARTICLE DENSITY 17         0.000
       MAX. OP. TEMP. 18         0.000
            ATTRITION 19         0.000
             COMMENTS 20         0.000

                                                                    MATERIAL CODE [illegible]202
MATERIAL CODE HC202

        CLASSIFICATION  1       -0.000 CAT, COBALT-MOLYBDATE ON AL203
           COMPOSITION  2        0.000 MO(O)3 14.6; CO(O) 3.2; AL203
      COST, 2CD ACTIVE  3     2100.000 COO 3.2%
       AVAILABLE SIZES  4        0.000 1/8 AND 5/32 INCH DIAMETERS
      AVAILABLE SHAPES  5       -0.000 PELLETS, CYLINDRICAL EXTRUSION
        CRUSH STRENGTH  6       10.000
              HARDNESS  7        0.000
             PORE SIZE  8        0.000
           PORE VOLUME  9        0.000
          SURFACE AREA 10      330.000
          BULK DENSITY 11       53.000 PACKED;
        CRYSTALLINITY 12         0.000
     CRYSTALLITE SIZE 13         0.000
           MAJOR USES 14         0.000 DESULFURIZATION; HYDROGENATION
           MAJOR USES 15         0.000
           VOLATILITY 16         0.000
     PARTICLE DENSITY 17         0.000
       MAX. OP. TEMP. 18         0.000
            ATTRITION 19         0.000
             COMMENTS 20        -0.000 REGENERATES, STEAM-AIR
```

```
MATERIAL CODE HC203                                        MATERIAL_CODE HC203

        CLASSIFICATION  1        -0.000 CHR, ALUMINA, HARD
           COMPOSITION  2         0.000 AL2O3 98.0% NA2O 0.1%
      COST, 2CD ACTIVE  3      1460.000 NA2O .1%
       AVAILABLE SIZES  4         0.000 3/32, 1/8, 5/32, 3/16 INCH
      AVAILABLE SHAPES  5        -0.000 PELLETS, CYLINDRICAL EXTRUSION
        CRUSH STRENGTH  6        15.000 MINIMUM: 30.0 MAXIMUM
              HARDNESS  7         5.000 MIN;KNIFE EDGE, 1000G.
             PORE SIZE  8         0.000
           PORE VOLUME  9         0.000
          SURFACE AREA 10       150.000 MINIMUM; 180 MAXIMUM
          BULK DENSITY 11        49.000 MINIMUM, 80 MAXIMUM
         CRYSTALLINITY 12         0.000 GAMMA ALUMINA
      CRYSTALLITE SIZE 13         0.000
            MAJOR USES 14        -0.000 REFORMING, ISOMERIZATION
            MAJOR USES 15        -0.000 ALKYLATION, DEHYDRATION
            VOLATILITY 16         0.000
      PARTICLE DENSITY 17        79.000
        MAX. OP. TEMP. 18         0.000
             ATTRITION 19         0.000
              COMMENTS 20        -0.000 TRUE DENSITY, SOLID 230


MATERIAL CODE HC204                                        MATERIAL CODE HC204

        CLASSIFICATION  1        -0.000 CAT, MINERAL
           COMPOSITION  2         0.000 SIO2 53%, AL2O3 45%
      COST, 2CD ACTIVE  3       650.000 AL2O3 45%
       AVAILABLE SIZES  4        -0.000 1/8 INCH
      AVAILABLE SHAPES  5         0.000
        CRUSH STRENGTH  6         0.000
              HARDNESS  7         0.000
             PORE SIZE  8         0.000
           PORE VOLUME  9         0.000
          SURFACE AREA 10          .080 MIN.  0.1 MAX.
          BULK DENSITY 11        56.000
         CRYSTALLINITY 12         0.000
      CRYSTALLITE SIZE 13         0.000
            MAJOR USES 14         0.000
            MAJOR USES 15         0.000
            VOLATILITY 16          .500 TO 2.0, 1400F
      PARTICLE DENSITY 17         0.000
        MAX. OP. TEMP. 18         0.000
             ATTRITION 19         0.000
              COMMENTS 20        -0.000 PROBABLY A NATURAL ZEOLITE
```

```
MATERIAL CODE HC205                                        MATERIAL CODE HC205

      CLASSIFICATION  1       -0.000 CAT, KAOLIN
         COMPOSITION  2        0.000 SIO2 53%, AL2O3 45% FE2O3 0.3%
    COST, 2CD ACTIVE  3      190.000 AL2O3 45%
     AVAILABLE SIZES  4        0.000 0.17-0.18 INCH DIAMETER
    AVAILABLE SHAPES  5       -0.000 PELLETS. CYLINDRICAL
      CRUSH STRENGTH  6        0.000
            HARDNESS  7       95.000 BALL MILL HARDNESS
           PORE SIZE  8        0.000
         PORE VOLUME  9        0.000
        SURFACE AREA 10       90.000 MINIMUM; 100 MAXIMUM
        BULK DENSITY 11       47.000
      CRYSTALLINITY 12         0.000
    CRYSTALLITE SIZE 13        0.000
         MAJOR USES 14         0.000
         MAJOR USES 15         0.000
         VOLATILITY 16         0.000
   PARTICLE DENSITY 17         0.000
    MAX. OP. TEMP. 18          0.000
          ATTRITION 19         0.000
           COMMENTS 20         0.000

MATERIAL CODE HC206                                        MATERIAL CODE HC206

      CLASSIFICATION  1       -0.000 CAT, PALLADIUM ON CARBON
         COMPOSITION  2       -0.000 PD. 5-10, AS SPECIFIED
    COST, 2CD ACTIVE  3    15600.000 CARBON
     AVAILABLE SIZES  4        0.000
    AVAILABLE SHAPES  5        0.000 POWDER
      CRUSH STRENGTH  6        0.000
            HARDNESS  7        0.000
           PORE SIZE  8        0.000
         PORE VOLUME  9        0.000
        SURFACE AREA 10        0.000
        BULK DENSITY 11        0.000
      CRYSTALLINITY 12         0.000
    CRYSTALLITE SIZE 13        0.000
         MAJOR USES 14         0.000 HYDROGENATION
         MAJOR USES 15         0.000
         VOLATILITY 16         0.000
   PARTICLE DENSITY 17         0.000
    MAX. OP. TEMP. 18          0.000
          ATTRITION 19         0.000
           COMMENTS 20         0.000
```

```
MATERIAL CODE HC207                                          MATERIAL CODE HC207

        CLASSIFICATION  1        -0.000 CAT, PLATINUM ON ALUMINA
           COMPOSITION  2         0.000 PT 0.5%, AL203 BAL.
     COST, 2CD ACTIVE   3     39000.000 NONE
       AVAILABLE SIZES  4         0.000 3/32 TO 5/32 INCH DIAM.
      AVAILABLE SHAPES  5        -0.000 PELLETS, CYLINDRICAL EXTRUSION
        CRUSH STRENGTH  6         0.000
              HARDNESS  7         0.000
             PORE SIZE  8         0.000
           PORE VOLUME  9         0.000
          SURFACE AREA 10        80.000
          BULK DENSITY 11         0.000
         CRYSTALLINITY 12         0.000
      CRYSTALLITE SIZE 13         0.000
            MAJOR USES 14         0.000 DEHYDROGENATION; HYDROGENATION
            MAJOR USES 15         0.000 REFORMING; ISOMERIZATION
            VOLATILITY 16         2.500 MAXIMUM
      PARTICLE DENSITY 17         0.000
        MAX. OP. TEMP. 18         0.000
             ATTRITION 19         0.000
              COMMENTS 20        -0.000 51 LBS./FT.3, LOADING DENSITY


MATERIAL CODE HC208                                          MATERIAL CODE HC208

        CLASSIFICATION  1        -0.000 CAT, PLATINUM ON ALUMINA
           COMPOSITION  2         0.000 PT 0.5%, AL203 BAL.
      COST, 2CD ACTIVE  3      5300.000 NONE
       AVAILABLE SIZES  4        -0.000 0.1 INCH DIAMETER
      AVAILABLE SHAPES  5         0.000
        CRUSH STRENGTH  6        21.200
              HARDNESS  7         0.000
             PORE SIZE  8         0.000
           PORE VOLUME  9         0.000
          SURFACE AREA 10       227.000
          BULK DENSITY 11        53.000
         CRYSTALLINITY 12         0.000
      CRYSTALLITE SIZE 13         0.000
            MAJOR USES 14         0.000
            MAJOR USES 15         0.000
            VOLATILITY 16         1.700 1400F
      PARTICLE DENSITY 17         0.000
        MAX. OP. TEMP. 18         0.000
             ATTRITION 19         0.000
              COMMENTS 20         0.000
```

```
MATERIAL CODE HC209                                          MATERIAL CODE HC209

      CLASSIFICATION  1        -0.000 CAT, SILICA-ALUMINA, SYNTHETIC
         COMPOSITION  2         0.000 SIO2 87.3%; AL2O3 12.4
   COST, 2CD ACTIVE   3       900.000 AL2O3 12.4%
    AVAILABLE SIZES   4         0.000 4X4 MM.
   AVAILABLE SHAPES   5         0.000 PELLETS
     CRUSH STRENGTH   6         0.000
           HARDNESS   7         0.000
          PORE SIZE   8        82.000
        PORE VOLUME   9         0.000
       SURFACE AREA  10       290.000 MINIMUM, 315 MAXIMUM
       BULK DENSITY  11        39.000
      CRYSTALLINITY  12         0.000
   CRYSTALLITE SIZE  13         0.000
         MAJOR USES  14         0.000 FIXED BED CRACKING:
         MAJOR USES  15        -0.000 ISOMERIZATION, ALSO CARRIER
         VOLATILITY  16         0.000
   PARTICLE DENSITY  17        62.000
     MAX. OP. TEMP.  18         0.000
          ATTRITION  19         0.000
           COMMENTS  20        -0.000 REGENERABLE BY AIR

MATERIAL CODE HS101                                          MATERIAL CODE HS101

      CLASSIFICATION  1        -0.000 CRR, ALUMINA CATALYST
         COMPOSITION  2        -0.000 AL2O3 99
   COST, 2CD ACTIVE   3         0.000 NONE
    AVAILABLE SIZES   4        -0.000 1/8 TO 1/4 INCH DIAMETER
   AVAILABLE SHAPES   5        -0.000 TABLET
     CRUSH STRENGTH   6         9.000 TO 25 (DEPENDING ON SIZE)
           HARDNESS   7         0.000
          PORE SIZE   8         0.000
        PORE VOLUME   9          .280 MIN. .33 MAX.
       SURFACE AREA  10        80.000 MIN. 100 MAX.
       BULK DENSITY  11        44.000 TO 58 (DEPENDING ON SIZE)
      CRYSTALLINITY  12         0.000
   CRYSTALLITE SIZE  13         0.000
         MAJOR USES  14        -0.000 DRYING AGENT, DEHYDRATION
         MAJOR USES  15         0.000
         VOLATILITY  16         0.000
   PARTICLE DENSITY  17         0.000
     MAX. OP. TEMP.  18         0.000
          ATTRITION  19         0.000
           COMMENTS  20        -0.000 ALUMINA IS ACTIVATED
```

```
MATERIAL CODE HS102                                      MATERIAL CODE HS102

        CLASSIFICATION  1       -0.000 CRR, ALUMINA CATALYST
           COMPOSITION  2       -0.000 AL203 96
     COST, 2CD ACTIVE   3        0.000 NONE
       AVAILABLE SIZES  4       -0.000 1/8 TO 3/8 INCH DIAMETER
      AVAILABLE SHAPES  5       -0.000 TABLET
        CRUSH STRENGTH  6       25.000 TO 63 (DEPENDING ON SIZE)
              HARDNESS  7        0.000     -
             PORE SIZE  8        0.000
           PORE VOLUME  9         .420 MIN. .51 MAX.
          SURFACE AREA 10      180.000 MIN. 200 MAX.
          BULK DENSITY 11       47.000 TO 65 (DEPENDING ON SIZE)
        CRYSTALLINITY  12        0.000
      CRYSTALLITE SIZE 13        0.000
           MAJOR USES  14       -0.000 DRYING AGENT, DEHYDRATION
           MAJOR USES  15        0.000
           VOLATILITY  16        0.000
     PARTICLE DENSITY  17        0.000
       MAX. OP. TEMP.  18        0.000
            ATTRITION  19        0.000
             COMMENTS  20       -0.000 HIGH ACTIVITY ALUMINA CARRIER
```

```
MATERIAL CODE HS103                                      MATERIAL CODE HS103

        CLASSIFICATION  1       -0.000 CRR, ALUMINA CATALYST
           COMPOSITION  2       -0.000 AL203 98
     COST, 2CD ACTIVE   3        0.000 NONE
       AVAILABLE SIZES  4       -0.000 1/8 INCH DIAMETER
      AVAILABLE SHAPES  5       -0.000 EXTRUSION
        CRUSH STRENGTH  6       31.000
              HARDNESS  7        0.000
             PORE SIZE  8        0.000
           PORE VOLUME  9         .560
          SURFACE AREA 10      181.000
          BULK DENSITY 11       42.000 PACKED
        CRYSTALLINITY  12        0.000
      CRYSTALLITE SIZE 13        0.000
           MAJOR USES  14        0.000
           MAJOR USES  15        0.000
           VOLATILITY  16        0.000
     PARTICLE DENSITY  17        0.000
       MAX. OP. TEMP.  18        0.000
            ATTRITION  19        0.000
             COMMENTS  20       -0.000 HIGH ACTIVITY ALUMINA CARRIER
```

```
MATERIAL CODE HS104                                    MATERIAL CODE HS104

        CLASSIFICATION  1       -0.000 CRR, ALUMINA CATALYST
           COMPOSITION  2       -0.000 AL203 92, SIO2 6
     COST, 2CD ACTIVE   3        0.000 SIO2 6%
      AVAILABLE SIZES   4       -0.000 1/8 INCH DIAMETER
     AVAILABLE SHAPES   5       -0.000 EXTRUSION
       CRUSH STRENGTH   6       19.000
             HARDNESS   7        0.000
            PORE SIZE   8        0.000
          PORE VOLUME   9         .910
         SURFACE AREA  10      277.000
         BULK DENSITY  11       33.000 PACKED
        CRYSTALLINITY  12        0.000
     CRYSTALLITE SIZE  13        0.000
           MAJOR USES  14        0.000
           MAJOR USES  15        0.000
           VOLATILITY  16        0.000
     PARTICLE DENSITY  17        0.000
       MAX. OP. TEMP.  18        0.000
            ATTRITION  19        0.000
             COMMENTS  20       -0.000 HIGH ACTIVITY ALUMINA CARRIER


MATERIAL CODE HS105                                    MATERIAL CODE HS105

        CLASSIFICATION  1       -0.000 CRR, ALUMINA CATALYST
           COMPOSITION  2       -0.000 AL203 97
     COST, 2CD ACTIVE   3        0.000 NONE
      AVAILABLE SIZES   4       -0.000 1/8 INCH DIAMETER
     AVAILABLE SHAPES   5       -0.000 EXTRUSION
       CRUSH STRENGTH   6       14.000
             HARDNESS   7        0.000
            PORE SIZE   8        0.000
          PORE VOLUME   9         .770
         SURFACE AREA  10      218.000
         BULK DENSITY  11       32.000 PACKED
        CRYSTALLINITY  12        0.000
     CRYSTALLITE SIZE  13        0.000
           MAJOR USES  14        0.000
           MAJOR USES  15        0.000
           VOLATILITY  16        0.000
     PARTICLE DENSITY  17        0.000
       MAX. OP. TEMP.  18        0.000
            ATTRITION  19        0.000
             COMMENTS  20       -0.000 HIGH ACTIVITY ALUMINA CARRIER
```

```
MATERIAL CODE HS106                                    MATERIAL CODE HS106

       CLASSIFICATION  1      -0.000 CAT, COBALT OXIDE ON ALUMINA
          COMPOSITION  2      -0.000 COO  10, BALANCE ALUMINA
     COST, 2CD ACTIVE  3       0.000 NONE
      AVAILABLE SIZES  4      -0.000 3/16 INCH DIAMETER
     AVAILABLE SHAPES  5      -0.000 EXTRUSION, BLACK
       CRUSH STRENGTH  6      50.000
             HARDNESS  7       0.000
            PORE SIZE  8       0.000
          PORE VOLUME  9        .070
         SURFACE AREA 10       6.800
         BULK DENSITY 11      75.000 PACKED
       CRYSTALLINITY 12        0.000
    CRYSTALLITE SIZE 13        0.000
          MAJOR USES 14       -0.000 SYNTHESIS OF HYDROGEN SULFIDE
          MAJOR USES 15        0.000
          VOLATILITY 16        0.000
    PARTICLE DENSITY 17        0.000
     MAX. OP. TEMP. 18         0.000
           ATTRITION 19        0.000
            COMMENTS 20        0.000

MATERIAL CODE HS107                                    MATERIAL CODE HS107

       CLASSIFICATION  1      -0.000 CAT, COO, CUO ON ALUMINA
          COMPOSITION  2      -0.000 COO 5, CUO 5, BALANCE ALUMINA
     COST, 2CD ACTIVE  3       0.000 COO 5%, CUO 5%
      AVAILABLE SIZES  4      -0.000 1/8 INCH DIAMETER
     AVAILABLE SHAPES  5      -0.000 TABLET, BLACK
       CRUSH STRENGTH  6      14.000
             HARDNESS  7       0.000
            PORE SIZE  8       0.000
          PORE VOLUME  9        .290
         SURFACE AREA 10      59.000
         BULK DENSITY 11      67.000 PACKED
       CRYSTALLINITY 12        0.000
    CRYSTALLITE SIZE 13        0.000
          MAJOR USES 14       -0.000 HYDROGENATION, DECOMPOSITION
          MAJOR USES 15        0.000
          VOLATILITY 16        0.000
    PARTICLE DENSITY 17        0.000
     MAX. OP. TEMP. 18         0.000
           ATTRITION 19        0.000
            COMMENTS 20       -0.000 ACTIVATED ALUMINA CARRIER
```

```
MATERIAL CODE HS108                                  MATERIAL CODE HS108

      CLASSIFICATION  1        -0.000 CAT. COO, MOO3 ON ALUMINA
         COMPOSITION  2        -0.000 COO 3, MOO3 9, BALANCE ALUMINA
    COST, 2CD ACTIVE  3         0.000 COO 3%
     AVAILABLE SIZES  4        -0.000 1/8 INCH DIAMETER
    AVAILABLE SHAPES  5        -0.000 TABLET
      CRUSH STRENGTH  6        24.000
            HARDNESS  7         0.000
           PORE SIZE  8         0.000
         PORE VOLUME  9          .400
        SURFACE AREA 10       160.000
        BULK DENSITY 11        60.000 PACKED
       CRYSTALLINITY 12         0.000
    CRYSTALLITE SIZE 13         0.000
          MAJOR USES 14        -0.000 HYDROCARBON DESULFURIZATION
          MAJOR USES 15         0.000
          VOLATILITY 16         0.000
    PARTICLE DENSITY 17         0.000
      MAX. OP. TEMP. 18         0.000
           ATTRITION 19         0.000
            COMMENTS 20         0.000

MATERIAL CODE HS109                                  MATERIAL CODE HS109

      CLASSIFICATION  1        -0.000 CAT, COO, MOO3 ON ALUMINA
         COMPOSITION  2        -0.000 COO 3, MOO3 12, BAL. AL2O3
    COST, 2CD ACTIVE  3         0.000 COO 3%
     AVAILABLE SIZES  4        -0.000 1/8 INCH DIAMETER
    AVAILABLE SHAPES  5        -0.000 TABLET
      CRUSH STRENGTH  6        24.000
            HARDNESS  7         0.000
           PORE SIZE  8         0.000
         PORE VOLUME  9          .400
        SURFACE AREA 10       166.000
        BULK DENSITY 11        64.000 PACKED
       CRYSTALLINITY 12         0.000
    CRYSTALLITE SIZE 13         0.000
          MAJOR USES 14        -0.000 HYDROCARBON DESULFURIZATION
          MAJOR USES 15         0.000
          VOLATILITY 16         0.000
    PARTICLE DENSITY 17         0.000
      MAX. OP. TEMP. 18         0.000
           ATTRITION 19         0.000
            COMMENTS 20         0.000
```

```
MATERIAL CODE HS110                                          MATERIAL CODE HS110

       CLASSIFICATION  1        -0.000 CAT, COO, MOO3 ON ALUMINA
          COMPOSITION  2        -0.000 COO 3, MOO3 9, BALANCE ALUMINA
     COST, 2CD ACTIVE  3         0.000 COO 3%
      AVAILABLE SIZES  4        -0.000 1/8 INCH DIAMETER
     AVAILABLE SHAPES  5        -0.000 TABLET
       CRUSH STRENGTH  6        24.000
             HARDNESS  7         0.000
            PORE SIZE  8         0.000
          PORE VOLUME  9          .400
         SURFACE AREA 10       160.000
         BULK DENSITY 11        69.000 PACKED
        CRYSTALLINITY 12         0.000
     CRYSTALLITE SIZE 13         0.000
           MAJOR USES 14        -0.000 HYDROCARBON DESULFURIZATION
           MAJOR USES 15         0.000
           VOLATILITY 16         0.000
     PARTICLE DENSITY 17         0.000
       MAX. OP. TEMP. 18         0.000
            ATTRITION 19         0.000
             COMMENTS 20         0.000

MATERIAL CODE HS111                                          MATERIAL CODE HS111

       CLASSIFICATION  1        -0.000 CAT, CHROME ALUMINA
          COMPOSITION  2        -0.000 CR203 12, MGO 2, BAL. ALUMINA
     COST, 2CD ACTIVE  3         0.000 MGO 2%
      AVAILABLE SIZES  4        -0.000 1/8 INCH DIAMETER
     AVAILABLE SHAPES  5        -0.000 TABLET, GREEN
       CRUSH STRENGTH  6         8.000
             HARDNESS  7         0.000
            PORE SIZE  8         0.000
          PORE VOLUME  9          .310
         SURFACE AREA 10        45.000
         BULK DENSITY 11        62.000 PACKED
        CRYSTALLINITY 12         0.000
     CRYSTALLITE SIZE 13         0.000
           MAJOR USES 14        -0.000 DEHYDROGENATION
           MAJOR USES 15         0.000
           VOLATILITY 16         0.000
     PARTICLE DENSITY 17         0.000
       MAX. OP. TEMP. 18         0.000
            ATTRITION 19         0.000
             COMMENTS 20        -0.000 ACTIVATED ALUMINA CARRIER
```

```
MATERIAL CODE HS112                                    MATERIAL CODE HS112

      CLASSIFICATION  1       -0.000 CAT, CHROMIUM OXIDE ON ALUMINA
         COMPOSITION  2       -0.000 CR203 19, BALANCE ALUMINA
    COST, 2CD ACTIVE  3        0.000 NONE
     AVAILABLE SIZES  4       -0.000 5/32 INCH DIAMETER
    AVAILABLE SHAPES  5       -0.000 TABLET
      CRUSH STRENGTH  6       19.000
            HARDNESS  7        0.000
           PORE SIZE  8        0.000
         PORE VOLUME  9         .290
       SURFACE AREA 10        60.000
        BULK DENSITY 11       60.000 PACKED
      CRYSTALLINITY 12         0.000
   CRYSTALLITE SIZE 13         0.000
         MAJOR USES 14        -0.000 DEHYDROGENATION OF BUTANE
         MAJOR USES 15         0.000
         VOLATILITY 16         0.000
   PARTICLE DENSITY 17         0.000
     MAX. OP. TEMP. 18         0.000
          ATTRITION 19         0.000
           COMMENTS 20        -0.000 ACTIVATED ALUMINA CARRIER


MATERIAL CODE HS113                                    MATERIAL CODE HS113

      CLASSIFICATION  1       -0.000 CAT, COPPER CHROMITE
         COMPOSITION  2       -0.000 CUO 37, CR203 52
    COST, 2CD ACTIVE  3        0.000 CUO 37%
     AVAILABLE SIZES  4       -0.000 1/8 INCH DIAMETER
    AVAILABLE SHAPES  5       -0.000 TABLET
      CRUSH STRENGTH  6       12.000
            HARDNESS  7        0.000
           PORE SIZE  8        0.000
         PORE VOLUME  9        0.000
       SURFACE AREA 10         0.000
        BULK DENSITY 11      105.000 PACKED
      CRYSTALLINITY 12         0.000
   CRYSTALLITE SIZE 13         0.000
         MAJOR USES 14        -0.000 HYDROGENATION
         MAJOR USES 15         0.000
         VOLATILITY 16         0.000
   PARTICLE DENSITY 17         0.000
     MAX. OP. TEMP. 18         0.000
          ATTRITION 19         0.000
           COMMENTS 20         0.000
```

```
MATERIAL CODE HS114                                    MATERIAL CODE HS114

     CLASSIFICATION  1        -0.000 CAT, CUO ON ALUMINA
        COMPOSITION  2        -0.000 CUO 5, BALANCE ALUMINA
   COST, 2CD ACTIVE  3         0.000 NONE
    AVAILABLE SIZES  4        -0.000 1/2 INCH DIAMETER
   AVAILABLE SHAPES  5        -0.000 SPHERE, GRAYISH BLACK
     CRUSH STRENGTH  6       240.000
           HARDNESS  7         0.000
          PORE SIZE  8         0.000
        PORE VOLUME  9          .070
       SURFACE AREA 10         1.000
       BULK DENSITY 11        75.000 PACKED
      CRYSTALLINITY 12         0.000
   CRYSTALLITE SIZE 13         0.000
        MAJOR USES  14        -0.000 REMOVE O2,CO,H2 -GAS STREAM
        MAJOR USES  15         0.000
         VOLATILITY 16         0.000
   PARTICLE DENSITY 17         0.000
     MAX. OP. TEMP. 18         0.000
          ATTRITION 19         0.000
           COMMENTS 20        -0.000 INERT ALUMINA CARRIER


MATERIAL CODE HS115                                    MATERIAL CODE HS115

     CLASSIFICATION  1        -0.000 CRR, MAGNESIA
        COMPOSITION  2        -0.000 MGO 98
   COST, 2CD ACTIVE  3         0.000 NONE
    AVAILABLE SIZES  4        -0.000 1/8 INCH DIAMETER
   AVAILABLE SHAPES  5        -0.000 TABLET, GRAY WHITE
     CRUSH STRENGTH  6        25.000
           HARDNESS  7         0.000
          PORE SIZE  8         0.000
        PORE VOLUME  9          .200
       SURFACE AREA 10        21.000
       BULK DENSITY 11        74.000 PACKED
      CRYSTALLINITY 12         0.000
   CRYSTALLITE SIZE 13         0.000
         MAJOR USES 14         0.000
         MAJOR USES 15         0.000
         VOLATILITY 16         0.000
   PARTICLE DENSITY 17         0.000
     MAX. OP. TEMP. 18         0.000
          ATTRITION 19         0.000
           COMMENTS 20         0.000
```

```
MATERIAL CODE HS116                                  MATERIAL CODE HS116

      CLASSIFICATION  1     -0.000 CAT, IRON OXIDE ON ALUMINA
         COMPOSITION  2     -0.000 FE203 5, BALANCE ALUMINA
    COST, 2CD ACTIVE  3      0.000 NONE
     AVAILABLE SIZES  4     -0.000 3/8 INCH DIAMETER
    AVAILABLE SHAPES  5     -0.000 SPHERE
      CRUSH STRENGTH  6     60.000
            HARDNESS  7      0.000
           PORE SIZE  8      0.000
         PORE VOLUME  9       .060
        SURFACE AREA 10      1.000
        BULK DENSITY 11     75.000 PACKED
       CRYSTALLINITY 12      0.000
    CRYSTALLITE SIZE 13      0.000
          MAJOR USES 14     -0.000 AMMONIA DECOMPOSITION
          MAJOR USES 15      0.000
          VOLATILITY 16      0.000
    PARTICLE DENSITY 17      0.000
      MAX. OP. TEMP. 18      0.000
           ATTRITION 19      0.000
            COMMENTS 20     -0.000 INERT ALUMINA CARRIER

MATERIAL CODE HS117                                  MATERIAL CODE HS117

      CLASSIFICATION  1     -0.000 CAT, MOLYBDENUM SULFIDE
         COMPOSITION  2     -0.000 MOS2 44
    COST, 2CD ACTIVE  3      0.000 NONE
     AVAILABLE SIZES  4      0.000
    AVAILABLE SHAPES  5     -0.000 POWDER, BROWN
      CRUSH STRENGTH  6      0.000
            HARDNESS  7      0.000
           PORE SIZE  8      0.000
         PORE VOLUME  9       .460
        SURFACE AREA 10     19.000
        BULK DENSITY 11     51.000 PACKED
       CRYSTALLINITY 12      0.000
    CRYSTALLITE SIZE 13      0.000
          MAJOR USES 14     -0.000 DEHYDROGENATION, HYDROGENATION
          MAJOR USES 15     -0.000 DESULFURIZATION
          VOLATILITY 16      0.000
    PARTICLE DENSITY 17      0.000
      MAX. OP. TEMP. 18      0.000
           ATTRITION 19      0.000
            COMMENTS 20      0.000
```

```
MATERIAL CODE HS118                                  MATERIAL CODE HS118

       CLASSIFICATION  1       -0.000 CAT, MNO2 ON ALUMINA
          COMPOSITION  2       -0.000 MNO2 19, BALANCE ALUMINA
     COST, 2CD ACTIVE  3        0.000 NONE
      AVAILABLE SIZES  4       -0.000 1/8 INCH DIAMETER
     AVAILABLE SHAPES  5       -0.000 TABLET, BLACK
       CRUSH STRENGTH  6       35.000
             HARDNESS  7        0.000
            PORE SIZE  8        0.000
          PORE VOLUME  9         .230
         SURFACE AREA 10       69.000
         BULK DENSITY 11       70.000 PACKED
        CRYSTALLINITY 12        0.000
     CRYSTALLITE SIZE 13        0.000
          MAJOR USES 14        -0.000 OXIDATION
          MAJOR USES 15         0.000
          VOLATILITY 16         0.000
    PARTICLE DENSITY 17         0.000
      MAX. OP. TEMP. 18         0.000
           ATTRITION 19         0.000
            COMMENTS 20        -0.000 ACTIVATED ALUMINA CARRIER


MATERIAL CODE HS119                                  MATERIAL CODE HS119

       CLASSIFICATION  1       -0.000 CAT, NICKEL OXIDE ON ALUMINA
          COMPOSITION  2       -0.000 NIO 32, BALANCE ALUMINA
     COST, 2CD ACTIVE  3        0.000 NONE
      AVAILABLE SIZES  4       -0.000 5/32 INCH DIAMETER
     AVAILABLE SHAPES  5       -0.000 TABLET
       CRUSH STRENGTH  6       23.000
             HARDNESS  7        0.000
            PORE SIZE  8        0.000
          PORE VOLUME  9         .230
         SURFACE AREA 10       52.000
         BULK DENSITY 11       87.000 PACKED
        CRYSTALLINITY 12        0.000
     CRYSTALLITE SIZE 13        0.000
          MAJOR USES 14        -0.000 HYDROGENATION
          MAJOR USES 15         0.000
          VOLATILITY 16         0.000
    PARTICLE DENSITY 17         0.000
      MAX. OP. TEMP. 18         0.000
           ATTRITION 19         0.000
            COMMENTS 20        -0.000 ACTIVE ALUMINA CARRIER
```

```
MATERIAL CODE HS120                                        MATERIAL CODE HS120

      CLASSIFICATION  1      -0.000 CAT, NI,W, ON ALUMINA,SULFIDED
         COMPOSITION  2      -0.000 NI 4.5, W 9.5, S , BAL. AL203
    COST, 2CD ACTIVE  3       0.000 NI 4.5%
     AVAILABLE SIZES  4      -0.000 1/8 INCH DIAMETER
    AVAILABLE SHAPES  5      -0.000 EXTRUSION
      CRUSH STRENGTH  6      24.000
            HARDNESS  7       0.000
           PORE SIZE  8       0.000
         PORE VOLUME  9        .410
        SURFACE AREA 10     194.000
        BULK DENSITY 11      60.000 PACKED
       CRYSTALLINITY 12       0.000
    CRYSTALLITE SIZE 13       0.000
         MAJOR USES  14      -0.000 HYDROGENATION, DENITROGENATION
         MAJOR USES  15       0.000
          VOLATILITY 16       0.000
    PARTICLE DENSITY 17       0.000
      MAX. OP. TEMP. 18       0.000
           ATTRITION 19       0.000
            COMMENTS 20      -0.000 MILDLY ACIDIC

MATERIAL CODE HS121                                        MATERIAL CODE HS121

      CLASSIFICATION  1      -0.000 CAT, VANADIA ON SILICA-ALUMINA
         COMPOSITION  2      -0.000 V205 10, BAL. SILICA-ALUMINA
    COST, 2CD ACTIVE  3       0.000 NONE
     AVAILABLE SIZES  4      -0.000 1/8 INCH DIAMETER
    AVAILABLE SHAPES  5      -0.000 TABLET, ORANGE
      CRUSH STRENGTH  6      23.000
            HARDNESS  7       0.000
           PORE SIZE  8       0.000
         PORE VOLUME  9        .450
        SURFACE AREA 10     139.000
        BULK DENSITY 11      54.000 PACKED
       CRYSTALLINITY 12       0.000
    CRYSTALLITE SIZE 13       0.000
          MAJOR USES 14      -0.000 OXIDATION
          MAJOR USES 15       0.000
          VOLATILITY 16       0.000
    PARTICLE DENSITY 17       0.000
      MAX. OP. TEMP. 18       0.000
           ATTRITION 19       0.000
            COMMENTS 20       0.000
```

```
MATERIAL CODE HS122                                    MATERIAL CODE HS122

        CLASSIFICATION  1       -0.000 CAT, VANADIA ON ALUMINA
           COMPOSITION  2       -0.000 V205 10, BALANCE ALUMINA
      COST, 2CD ACTIVE  3        0.000 NONE
       AVAILABLE SIZES  4       -0.000 1/8 INCH DIAMETER
      AVAILABLE SHAPES  5       -0.000 TABLETS, ORANGE
        CRUSH STRENGTH  6       26.000
              HARDNESS  7        0.000
             PORE SIZE  8        0.000
           PORE VOLUME  9         .280
          SURFACE AREA 10      115.000
          BULK DENSITY 11       60.000 PACKED
         CRYSTALLINITY 12        0.000
      CRYSTALLITE SIZE 13        0.000
            MAJOR USES 14       -0.000 OXIDATION
            MAJOR USES 15        0.000
            VOLATILITY 16        0.000
      PARTICLE DENSITY 17        0.000
        MAX. OP. TEMP. 18        0.000
             ATTRITION 19        0.000
              COMMENTS 20       -0.000 HIGH ACTIVITY ALUMINA CARRIER


MATERIAL CODE HS123                                    MATERIAL CODE HS123

        CLASSIFICATION  1       -0.000 CAT, VANADIA ON ALUMINA
           COMPOSITION  2       -0.000 V205 10, BALANCE ALUMINA
      COST, 2CD ACTIVE  3        0.000 NONE
       AVAILABLE SIZES  4       -0.000 1/4 INCH DIAMETER
      AVAILABLE SHAPES  5       -0.000 SPHERE, ORANGE
        CRUSH STRENGTH  6        0.000
              HARDNESS  7        0.000
             PORE SIZE  8        0.000
           PORE VOLUME  9        0.000
          SURFACE AREA 10        1.000
          BULK DENSITY 11       80.000 PACKED
         CRYSTALLINITY 12        0.000
      CRYSTALLITE SIZE 13        0.000
            MAJOR USES 14       -0.000 OXIDATION
            MAJOR USES 15        0.000
            VOLATILITY 16        0.000
      PARTICLE DENSITY 17        0.000
        MAX. OP. TEMP. 18        0.000
             ATTRITION 19        0.000
              COMMENTS 20       -0.000 INERT ALUMINA CARRIER
```

```
MATERIAL CODE HS124                                            MATERIAL CODE HS124

        CLASSIFICATION  1        -0.000 CAT, ZINC
           COMPOSITION  2        -0.000 ZNO 75, AL, MG, CA, CR OXIDES
      COST, 2CD ACTIVE  3         0.000 AL203
       AVAILABLE SIZES  4        -0.000 1/4 INCH DIAMETER
      AVAILABLE SHAPES  5        -0.000 TABLET
        CRUSH STRENGTH  6       100.000
              HARDNESS  7         0.000
             PORE SIZE  8         0.000
           PORE VOLUME  9          .120
          SURFACE AREA 10        11.000
          BULK DENSITY 11       112.000 PACKED
         CRYSTALLINITY 12         0.000
      CRYSTALLITE SIZE 13         0.000
            MAJOR USES 14        -0.000 DESULFURIZATION
            MAJOR USES 15         0.000
            VOLATILITY 16         0.000
      PARTICLE DENSITY 17         0.000
        MAX. OP. TEMP. 18         0.000
             ATTRITION 19         0.000
              COMMENTS 20         0.000


MATERIAL CODE HS125                                            MATERIAL CODE HS125

        CLASSIFICATION  1        -0.000 CAT, CHROMITE
           COMPOSITION  2        -0.000 ZNO 74, CR203 23
      COST, 2CD ACTIVE  3         0.000 CR203 23%
       AVAILABLE SIZES  4        -0.000 3/16 TO 3/8 INCH DIAMETER
      AVAILABLE SHAPES  5        -0.000 TABLET
        CRUSH STRENGTH  6         0.000
              HARDNESS  7         0.000
             PORE SIZE  8         0.000
           PORE VOLUME  9         0.000
          SURFACE AREA 10         0.000
          BULK DENSITY 11         0.000
         CRYSTALLINITY 12         0.000
      CRYSTALLITE SIZE 13         0.000
            MAJOR USES 14        -0.000 SYNTHESIZE METHANOL
            MAJOR USES 15         0.000
            VOLATILITY 16         0.000
      PARTICLE DENSITY 17         0.000
        MAX. OP. TEMP. 18         0.000
             ATTRITION 19         0.000
              COMMENTS 20        -0.000 CATALYST REQUIRES REDUCTION
```

```
MATERIAL CODE HS126                                          MATERIAL CODE HS126

      CLASSIFICATION  1        -0.000 CAT, SILVER ON ALUMINA
         COMPOSITION  2        -0.000 AG 4.0 BALANCE AL203
    COST, 2CD ACTIVE  3         0.000 NONE
     AVAILABLE SIZES  4         0.000
    AVAILABLE SHAPES  5        -0.000 1/8 IN. EXTRUSION
      CRUSH STRENGTH  6         0.000
            HARDNESS  7         0.000
           PORE SIZE  8         0.000
         PORE VOLUME  9         0.000
        SURFACE AREA 10         0.000
        BULK DENSITY 11        80.000
      CRYSTALLINITY 12         0.000
   CRYSTALLITE SIZE 13         0.000
          MAJOR USES 14        -0.000 OXIDATION OF METHANOL TO FORM-
          MAJOR USES 15        -0.000 ALDEHYDE
          VOLATILITY 16         0.000
    PARTICLE DENSITY 17         0.000
      MAX. OP. TEMP. 18         0.000
           ATTRITION 19         0.000
            COMMENTS 20         0.000


MATERIAL CODE HS127                                          MATERIAL CODE HS127

      CLASSIFICATION  1        -0.000 SOR, ALUMINA
         COMPOSITION  2        -0.000 AL203 98%, BALANCE MOISTURE
    COST, 2CD ACTIVE  3         0.000 NONE
     AVAILABLE SIZES  4         0.000
    AVAILABLE SHAPES  5        -0.000 POWDER
      CRUSH STRENGTH  6         0.000
            HARDNESS  7         0.000
           PORE SIZE  8         0.000
         PORE VOLUME  9         0.000
        SURFACE AREA 10         0.000
        BULK DENSITY 11        55.000
       CRYSTALLINITY 12         0.000
    CRYSTALLITE SIZE 13         0.000
          MAJOR USES 14         0.000
          MAJOR USES 15         0.000
          VOLATILITY 16         0.000
    PARTICLE DENSITY 17         0.000
      MAX. OP. TEMP. 18         0.000
           ATTRITION 19         0.000
            COMMENTS 20         0.000
```

```
MATERIAL CODE HS128                                        MATERIAL CODE HS128

         CLASSIFICATION  1        -0.000 SOR, ALUMINA
            COMPOSITION  2        -0.000 AL2O3 98%, BALANCE MOISTURE
       COST, 2CD ACTIVE  3         0.000 NONE
        AVAILABLE SIZES  4         0.000
       AVAILABLE SHAPES  5        -0.000 POWDER
         CRUSH STRENGTH  6         0.000
               HARDNESS  7         0.000
              PORE SIZE  8         0.000
            PORE VOLUME  9         0.000
           SURFACE AREA 10       150.000
           BULK DENSITY 11        54.000
         CRYSTALLINITY 12          0.000
     CRYSTALLITE SIZE 13           0.000
            MAJOR USES 14          0.000
            MAJOR USES 15          0.000
            VOLATILITY 16          0.000
      PARTICLE DENSITY 17          0.000
        MAX. OP. TEMP. 18          0.000
             ATTRITION 19          0.000
              COMMENTS 20          0.000


MATERIAL CODE HS129                                        MATERIAL CODE HS129

         CLASSIFICATION  1        -0.000 SOR, ALUMINA
            COMPOSITION  2        -0.000 AL2O3 92%
       COST, 2CD ACTIVE  3         0.000 NONE
        AVAILABLE SIZES  4        -0.000 80-325 MESH
       AVAILABLE SHAPES  5        -0.000 POWDER
         CRUSH STRENGTH  6         0.000
               HARDNESS  7         0.000
              PORE SIZE  8         0.000
            PORE VOLUME  9         0.000
           SURFACE AREA 10         0.000
           BULK DENSITY 11        55.000
         CRYSTALLINITY 12          0.000
     CRYSTALLITE SIZE 13           0.000
            MAJOR USES 14         -0.000 CHROMATOGRAPHIC ADSORPTION
            MAJOR USES 15          0.000
            VOLATILITY 16          0.000
      PARTICLE DENSITY 17          0.000
        MAX. OP. TEMP. 18          0.000
             ATTRITION 19          0.000
              COMMENTS 20          0.000
```

```
MATERIAL CODE HS130                                          MATERIAL CODE HS130

       CLASSIFICATION  1       -0.000 CRR, ALUMINA
          COMPOSITION  2       -0.000 AL203 97%
     COST, 2CD ACTIVE  3        0.000 NONE
      AVAILABLE SIZES  4       -0.000 76% <80 MICRONS,24%>80 MICRONS
     AVAILABLE SHAPES  5       -0.000 POWDER (MICROSPHEROIDAL)
       CRUSH STRENGTH  6        0.000
             HARDNESS  7        0.000
            PORE SIZE  8        0.000
          PORE VOLUME  9         .500
         SURFACE AREA 10      200.000
         BULK DENSITY 11       60.000
       CRYSTALLINITY  12        0.000
     CRYSTALLITE SIZE 13        0.000
           MAJOR USES 14       -0.000 FLUID BED OPERATIONS
           MAJOR USES 15        0.000
           VOLATILITY 16        0.000
     PARTICLE DENSITY 17        0.000
       MAX. OP. TEMP. 18        0.000
            ATTRITION 19        0.000
             COMMENTS 20        0.000


MATERIAL CODE HS131                                          MATERIAL CODE HS131

       CLASSIFICATION  1       -0.000 CRR, ALUMINA
          COMPOSITION  2       -0.000 AL203 92%, SIO2 6%
     COST, 2CD ACTIVE  3        0.000 SIO2
      AVAILABLE SIZES  4        0.000
     AVAILABLE SHAPES  5       -0.000 POWDER
       CRUSH STRENGTH  6        0.000
             HARDNESS  7        0.000
            PORE SIZE  8        0.000
          PORE VOLUME  9        0.000
         SURFACE AREA 10      240.000
         BULK DENSITY 11       60.000
       CRYSTALLINITY  12        0.000
     CRYSTALLITE SIZE 13        0.000
           MAJOR USES 14        0.000
           MAJOR USES 15        0.000
           VOLATILITY 16        0.000
     PARTICLE DENSITY 17        0.000
       MAX. OP. TEMP. 18        0.000
            ATTRITION 19        0.000
             COMMENTS 20        0.000
```

```
MATERIAL CODE HS132                                      MATERIAL CODE HS132

       CLASSIFICATION  1        -0.000 CAT,BARIUM CHLORIDE ON CARBON
          COMPOSITION  2        -0.000 BACL2 27%, BALANCE CARBON
     COST. 2CD ACTIVE  3         0.000 NONE
      AVAILABLE SIZES  4        -0.000 4-6 MESH
     AVAILABLE SHAPES  5        -0.000 GRANULE (EXTRUSION
       CRUSH STRENGTH  6         0.000
             HARDNESS  7         0.000
            PORE SIZE  8         0.000
          PORE VOLUME  9         0.000
         SURFACE AREA 10         0.000
         BULK DENSITY 11        34.000
      CRYSTALLINITY 12           0.000
    CRYSTALLITE SIZE 13          0.000
          MAJOR USES 14         -0.000 REMOVAL OF HCL2 FROM CHLORINE
          MAJOR USES 15         -0.000 CONTAINING HYDROCARBON
          VOLATILITY 16          0.000
    PARTICLE DENSITY 17          0.000
      MAX. OP. TEMP. 18          0.000
           ATTRITION 19          0.000
            COMMENTS 20          0.000

MATERIAL CODE HS133                                      MATERIAL CODE HS133

       CLASSIFICATION  1        -0.000 CAT,COBALT OXIDE ON KIESELGUHR
          COMPOSITION  2        -0.000 COO 35%, BALANCE KIESELGUHR
     COST, 2CD ACTIVE  3         0.000 NONE
      AVAILABLE SIZES  4        -0.000 3/16X3/16 INCH
     AVAILABLE SHAPES  5        -0.000 TABLETS
       CRUSH STRENGTH  6        17.500
             HARDNESS  7         0.000
            PORE SIZE  8         0.000
          PORE VOLUME  9          .350
         SURFACE AREA 10       130.000
         BULK DENSITY 11        71.000
       CRYSTALLINITY 12          0.000
    CRYSTALLITE SIZE 13          0.000
          MAJOR USES 14         -0.000 HYDROGENATION CATALYST
          MAJOR USES 15          0.000
          VOLATILITY 16          0.000
    PARTICLE DENSITY 17          0.000
      MAX. OP. TEMP. 18          0.000
           ATTRITION 19          0.000
            COMMENTS 20          0.000
```

```
MATERIAL CODE HS134                                      MATERIAL CODE HS134

      CLASSIFICATION  1      -0.000 CAT. COBALT ON KIESELGUHR
         COMPOSITION  2      -0.000 CO 39% BALANCE KIESELGUHR
    COST, 2CD ACTIVE  3       0.000 NONE
     AVAILABLE SIZES  4      -0.000 3/16X3/16 INCH
    AVAILABLE SHAPES  5      -0.000 TABLETS
      CRUSH STRENGTH  6      15.000
            HARDNESS  7       0.000
           PORE SIZE  8       0.000
         PORE VOLUME  9        .400
        SURFACE AREA 10     140.000
        BULK DENSITY 11      70.000
      CRYSTALLINITY  12       0.000
   CRYSTALLITE SIZE  13       0.000
         MAJOR USES  14      -0.000 OXO PROCESS + RELATED HYDROGEN
         MAJOR USES  15      -0.000 ATION REACTIONS.
         VOLATILITY  16       0.000
   PARTICLE DENSITY  17       0.000
     MAX. OP. TEMP.  18       0.000
          ATTRITION  19       0.000
           COMMENTS  20       0.000


MATERIAL CODE HS135                                      MATERIAL CODE HS135

      CLASSIFICATION  1      -0.000 CAT, COBALT CATALYST
         COMPOSITION  2      -0.000 COO 13% ON SIO2 TYPE BASE
    COST, 2CD ACTIVE  3       0.000 NONE
     AVAILABLE SIZES  4      -0.000 4-8 MESH
    AVAILABLE SHAPES  5      -0.000 GRANULES (BLACK)
      CRUSH STRENGTH  6       0.000
            HARDNESS  7       0.000
           PORE SIZE  8       0.000
         PORE VOLUME  9        .360
        SURFACE AREA 10       1.000
        BULK DENSITY 11      30.000
      CRYSTALLINITY  12       0.000
   CRYSTALLITE SIZE  13       0.000
         MAJOR USES  14      -0.000 OXO SYNTHESIS PROCESS + HYDRO-
         MAJOR USES  15      -0.000 GENATION REACTIONS.
         VOLATILITY  16       0.000
   PARTICLE DENSITY  17       0.000
     MAX. OP. TEMP.  18       0.000
          ATTRITION  19       0.000
           COMMENTS  20       0.000
```

```
MATERIAL CODE HS136                                    MATERIAL CODE HS136

       CLASSIFICATION  1       -0.000 CAT, COBALT CATALYST
          COMPOSITION  2       -0.000 COO 6% ON SIO2 TYPE BASE
     COST, 2CD ACTIVE  3        0.000 NONE
      AVAILABLE SIZES  4       -0.000 4-8 MESH
     AVAILABLE SHAPES  5       -0.000 GRANULES
       CRUSH STRENGTH  6        0.000
             HARDNESS  7        0.000
            PORE SIZE  8        0.000
          PORE VOLUME  9         .380
         SURFACE AREA 10        1.000
         BULK DENSITY 11       31.000
        CRYSTALLINITY 12        0.000
     CRYSTALLITE SIZE 13        0.000
          MAJOR USES 14       -0.000 OXO SYNTHESIS PROCESS + HYDRO-
          MAJOR USES 15       -0.000 GENATION REACTIONS.
          VOLATILITY 16        0.000
     PARTICLE DENSITY 17        0.000
      MAX. OP. TEMP. 18        0.000
           ATTRITION 19        0.000
            COMMENTS 20        0.000


MATERIAL CODE HS137                                    MATERIAL CODE HS137

       CLASSIFICATION  1       -0.000 CAT, COBALT CATALYST
          COMPOSITION  2       -0.000 COO 20% ON SIO2 TYPE BASE
     COST. 2CD ACTIVE  3        0.000 NONE
      AVAILABLE SIZES  4       -0.000 4-8 MESH
     AVAILABLE SHAPES  5       -0.000 GRANULES (BLACK)
       CRUSH STRENGTH  6        0.000
             HARDNESS  7        0.000
            PORE SIZE  8        0.000
          PORE VOLUME  9         .380
         SURFACE AREA 10        6.000
         BULK DENSITY 11       30.000
        CRYSTALLINITY 12        0.000
     CRYSTALLITE SIZE 13        0.000
          MAJOR USES 14       -0.000 OXO PROCESS TO CONVERT ALDE-
          MAJOR USES 15       -0.000 HYDES TO ALCOHOLS.
          VOLATILITY 16        0.000
     PARTICLE DENSITY 17        0.000
      MAX. OP. TEMP. 18        0.000
           ATTRITION 19        0.000
            COMMENTS 20        0.000
```

```
MATERIAL CODE HS138                                      MATERIAL CODE HS138

     CLASSIFICATION  1        -0.000 CAT, COBALT CATALYST
        COMPOSITION  2        -0.000 COO 10%, BAL. ACTIVATED AL203
   COST, 2CD ACTIVE  3         0.000 NONE
    AVAILABLE SIZES  4        -0.000 1/8X1/8 INCH
   AVAILABLE SHAPES  5        -0.000 TABLETS (BLACK)
     CRUSH STRENGTH  6        17.000
           HARDNESS  7         0.000
          PORE SIZE  8         0.000
        PORE VOLUME  9          .510
       SURFACE AREA 10        60.000
       BULK DENSITY 11        60.000
     CRYSTALLINITY 12          0.000
  CRYSTALLITE SIZE 13          0.000
        MAJOR USES 14         -0.000 HYDROGENATION CATALYST
        MAJOR USES 15          0.000
        VOLATILITY 16          0.000
  PARTICLE DENSITY 17          0.000
    MAX. OP. TEMP. 18          0.000
         ATTRITION 19          0.000
          COMMENTS 20          0.000


MATERIAL CODE HS139                                      MATERIAL CODE HS139

     CLASSIFICATION  1        -0.000 CAT, COBALT CATALYST
        COMPOSITION  2        -0.000 COO 18%, BAL. ACTIVATED AL203
   COST, 2CD ACTIVE  3         0.000 NONE
    AVAILABLE SIZES  4        -0.000 1/8X1/8 INCH
   AVAILABLE SHAPES  5        -0.000 TABLETS (BLACK)
     CRUSH STRENGTH  6        25.000
           HARDNESS  7         0.000
          PORE SIZE  8         0.000
        PORE VOLUME  9          .380
       SURFACE AREA 10        49.000
       BULK DENSITY 11        77.000
     CRYSTALLINITY 12          0.000
  CRYSTALLITE SIZE 13          0.000
        MAJOR USES 14          0.000
        MAJOR USES 15          0.000
        VOLATILITY 16          0.000
  PARTICLE DENSITY 17          0.000
    MAX. OP. TEMP. 18          0.000
         ATTRITION 19          0.000
          COMMENTS 20          0.000
```

```
MATERIAL CODE HS140                                        MATERIAL CODE HS140

      CLASSIFICATION  1      -0.000 CAT, COBALT MOLYBDATE CATALYST
         COMPOSITION  2      -0.000 COO 3, MOO3 15, BALANCE AL2O3
    COST, 2CD ACTIVE  3       0.000 COO 3%
     AVAILABLE SIZES  4      -0.000 1/8X1/8 INCH
    AVAILABLE SHAPES  5      -0.000 TABLET
      CRUSH STRENGTH  6      24.000
            HARDNESS  7       0.000
           PORE SIZE  8       0.000
         PORE VOLUME  9        .400
        SURFACE AREA 10     200.000
        BULK DENSITY 11      60.000
      CRYSTALLINITY 12       0.000
   CRYSTALLITE SIZE 13       0.000
          MAJOR USES 14      -0.000 DENITROGENATION + DESULFURIZA-
          MAJOR USES 15      -0.000 TION OF HYDROCARBONS.
          VOLATILITY 16       0.000
    PARTICLE DENSITY 17       0.000
      MAX. OP. TEMP. 18       0.000
           ATTRITION 19       0.000
            COMMENTS 20       0.000


MATERIAL CODE HS141                                        MATERIAL CODE HS141

      CLASSIFICATION  1      -0.000 CAT, CHROME ALUMINA
         COMPOSITION  2      -0.000 CR2O3 12, BAL. ACTIVATED AL2O3
    COST. 2CD ACTIVE  3       0.000 NONE
     AVAILABLE SIZES  4      -0.000 1/8X1/8 INCH
    AVAILABLE SHAPES  5      -0.000 TABLETS (GREEN)
      CRUSH STRENGTH  6      10.000
            HARDNESS  7       0.000
           PORE SIZE  8       0.000
         PORE VOLUME  9        .350
        SURFACE AREA 10      63.000
        BULK DENSITY 11      60.000
      CRYSTALLINITY 12       0.000
   CRYSTALLITE SIZE 13       0.000
          MAJOR USES 14      -0.000 DEHYDROGENATION
          MAJOR USES 15       0.000
          VOLATILITY 16       0.000
    PARTICLE DENSITY 17       0.000
      MAX. OP. TEMP. 18       0.000
           ATTRITION 19       0.000
            COMMENTS 20       0.000
```

```
MATERIAL CODE HS142                                   MATERIAL CODE HS142

       CLASSIFICATION  1       -0.000 CAT, CHROME ALUMINA
          COMPOSITION  2       -0.000 CR203 5%, BAL. ACTIVATED AL203
     COST, 2CD ACTIVE  3        0.000 NONE
      AVAILABLE SIZES  4       -0.000 1/8X1/8 INCH
     AVAILABLE SHAPES  5       -0.000 TABLETS (GREEN)
       CRUSH STRENGTH  6       24.000
             HARDNESS  7        0.000
            PORE SIZE  8        0.000
          PORE VOLUME  9         .360
         SURFACE AREA 10      160.000
         BULK DENSITY 11       67.500
       CRYSTALLINITY 12        0.000
    CRYSTALLITE SIZE 13        0.000
          MAJOR USES 14       -0.000 DEHYDROGENATION
          MAJOR USES 15        0.000
          VOLATILITY 16        0.000
    PARTICLE DENSITY 17        0.000
       MAX. OP. TEMP. 18        0.000
           ATTRITION 19        0.000
            COMMENTS 20        0.000

MATERIAL CODE HS143                                   MATERIAL CODE HS143

       CLASSIFICATION  1       -0.000 CAT, CHROME ALUMINA
          COMPOSITION  2       -0.000 CR203 9%,K20 1.5%,BAL. AL203
     COST, 2CD ACTIVE  3        0.000 K20
      AVAILABLE SIZES  4       -0.000 1/8X1/8 INCH
     AVAILABLE SHAPES  5       -0.000 TABLETS
       CRUSH STRENGTH  6       11.000
             HARDNESS  7        0.000
            PORE SIZE  8        0.000
          PORE VOLUME  9         .340
         SURFACE AREA 10       67.000
         BULK DENSITY 11       67.500
       CRYSTALLINITY 12        0.000
    CRYSTALLITE SIZE 13        0.000
          MAJOR USES 14       -0.000 DEHYDOGENATION
          MAJOR USES 15        0.000
          VOLATILITY 16        0.000
    PARTICLE DENSITY 17        0.000
       MAX. OP. TEMP. 18        0.000
           ATTRITION 19        0.000
            COMMENTS 20        0.000
```

```
MATERIAL CODE HS144                                     MATERIAL CODE HS144

      CLASSIFICATION  1        -0.000 CAT, CHROME ALUMINA
         COMPOSITION  2        -0.000 CR203 33, BAL. SILICATED AL203
     COST, 2CD ACTIVE  3         0.000 NONE
     AVAILABLE SIZES  4        -0.000 1/8X1/8 INCH
    AVAILABLE SHAPES  5        -0.000 TABLETS (GREEN)
      CRUSH STRENGTH  6        40.000
            HARDNESS  7         0.000
           PORE SIZE  8         0.000
         PORE VOLUME  9          .260
        SURFACE AREA 10       120.000
        BULK DENSITY 11        73.500
       CRYSTALLINITY 12         0.000
     CRYSTALLITE SIZE 13         0.000
          MAJOR USES 14         0.000
          MAJOR USES 15         0.000
          VOLATILITY 16         0.000
     PARTICLE DENSITY 17         0.000
       MAX. OP. TEMP. 18         0.000
           ATTRITION 19         0.000
            COMMENTS 20         0.000


MATERIAL CODE HS145                                     MATERIAL CODE HS145

      CLASSIFICATION  1        -0.000 CAT, CHROME ALUMINA
         COMPOSITION  2        -0.000 CR203 19, BAL. ACTIVATED AL203
     COST, 2CD ACTIVE  3         0.000 NONE
     AVAILABLE SIZES  4        -0.000 0-80 MESH
    AVAILABLE SHAPES  5        -0.000 POWDER (MICROSPHERIODAL)
      CRUSH STRENGTH  6         0.000
            HARDNESS  7         0.000
           PORE SIZE  8         0.000
         PORE VOLUME  9          .500
        SURFACE AREA 10       100.000
        BULK DENSITY 11        53.000
       CRYSTALLINITY 12         0.000
     CRYSTALLITE SIZE 13         0.000
          MAJOR USES 14        -0.000 DEHYDROGENATION CATALYST FOR
          MAJOR USES 15        -0.000 FLUID BED USE.
          VOLATILITY 16         0.000
     PARTICLE DENSITY 17         0.000
       MAX. OP. TEMP. 18         0.000
           ATTRITION 19         0.000
            COMMENTS 20         0.000
```

```
MATERIAL CODE HS146                                      MATERIAL CODE HS146

     CLASSIFICATION  1         -0.000 CAT, CHROME ALUMINA
        COMPOSITION  2         -0.000 CR203 19,BAL. ACTIVATED AL203
   COST, 2CD ACTIVE  3          0.000 NONE
    AVAILABLE SIZES  4         -0.000 1/8X1/8 INCH
   AVAILABLE SHAPES  5         -0.000 TABLETS (GREEN)
     CRUSH STRENGTH  6         35.000
           HARDNESS  7          0.000
          PORE SIZE  8          0.000
        PORE VOLUME  9           .380
       SURFACE AREA 10        100.000
       BULK DENSITY 11         72.000
      CRYSTALLINITY 12          0.000
   CRYSTALLITE SIZE 13          0.000
         MAJOR USES 14         -0.000 DEHYDROGENATION OF BUTANE TO
         MAJOR USES 15         -0.000 BUTYLENE.
         VOLATILITY 16          0.000
   PARTICLE DENSITY 17          0.000
     MAX. OP. TEMP. 18          0.000
          ATTRITION 19          0.000
           COMMENTS 20          0.000
```

```
MATERIAL CODE HS147                                      MATERIAL CODE HS147

     CLASSIFICATION  1         -0.000 CAT, COPPER CHROMATE
        COMPOSITION  2         -0.000 CUO 82,CR203 17
   COST, 2CD ACTIVE  3          0.000 CR203
    AVAILABLE SIZES  4          0.000
   AVAILABLE SHAPES  5         -0.000 POWDER
     CRUSH STRENGTH  6          0.000
           HARDNESS  7          0.000
          PORE SIZE  8          0.000
        PORE VOLUME  9           .550
       SURFACE AREA 10         13.000
       BULK DENSITY 11         55.000
      CRYSTALLINITY 12          0.000
   CRYSTALLITE SIZE 13          0.000
         MAJOR USES 14          0.000
         MAJOR USES 15          0.000
         VOLATILITY 16          0.000
   PARTICLE DENSITY 17          0.000
     MAX. OP. TEMP. 18          0.000
          ATTRITION 19          0.000
           COMMENTS 20          0.000
```

```
MATERIAL CODE HS148                                        MATERIAL CODE HS148

       CLASSIFICATION  1       -0.000 CAT, COPPER CHROMITE
          COMPOSITION  2       -0.000 CUO 80, CR203 17
     COST, 2CD ACTIVE  3        0.000 CR203
      AVAILABLE SIZES  4       -0.000 1/8X1/8 INCH
     AVAILABLE SHAPES  5       -0.000 TABLETS
       CRUSH STRENGTH  6       28.000
             HARDNESS  7        0.000
            PORE SIZE  8        0.000
          PORE VOLUME  9        0.000
         SURFACE AREA 10        0.000
         BULK DENSITY 11      135.000
        CRYSTALLINITY 12        0.000
     CRYSTALLITE SIZE 13        0.000
          MAJOR USES  14        0.000
          MAJOR USES  15        0.000
           VOLATILITY 16        0.000
     PARTICLE DENSITY 17        0.000
       MAX. OP. TEMP. 18        0.000
            ATTRITION 19        0.000
             COMMENTS 20       -0.000 TABLETED CU-0202P (HS147)


MATERIAL CODE HS149                                        MATERIAL CODE HS149

       CLASSIFICATION  1       -0.000 CAT, COPPER CHROMITE
          COMPOSITION  2       -0.000 CR203 44, CUO 41, BAO 11
     COST, 2CD ACTIVE  3        0.000 CUO
      AVAILABLE SIZES  4        0.000
     AVAILABLE SHAPES  5       -0.000 POWDER
       CRUSH STRENGTH  6        0.000
             HARDNESS  7        0.000
            PORE SIZE  8        0.000
          PORE VOLUME  9         .470
         SURFACE AREA 10       15.000
         BULK DENSITY 11       54.000
        CRYSTALLINITY 12        0.000
     CRYSTALLITE SIZE 13        0.000
          MAJOR USES  14        0.000
          MAJOR USES  15        0.000
           VOLATILITY 16        0.000
     PARTICLE DENSITY 17        0.000
       MAX. OP. TEMP. 18        0.000
            ATTRITION 19        0.000
             COMMENTS 20        0.000
```

```
MATERIAL CODE HS150                                        MATERIAL CODE HS150

       CLASSIFICATION  1        -0.000 CAT, COPPER CHROMITE
          COMPOSITION  2        -0.000 CR203 38, CUO 35, BAO 10
     COST, 2CD ACTIVE  3         0.000 CUO
      AVAILABLE SIZES  4        -0.000 1/8X1/8 INCH
     AVAILABLE SHAPES  5        -0.000 TABLETS
       CRUSH STRENGTH  6        12.000
             HARDNESS  7         0.000
            PORE SIZE  8         0.000
          PORE VOLUME  9         0.000
         SURFACE AREA 10         0.000
         BULK DENSITY 11       101.000
        CRYSTALLINITY 12         0.000
     CRYSTALLITE SIZE 13         0.000
          MAJOR USES  14         0.000
          MAJOR USES  15         0.000
          VOLATILITY  16         0.000
     PARTICLE DENSITY 17         0.000
      MAX. OP. TEMP.  18         0.000
           ATTRITION  19         0.000
            COMMENTS  20        -0.000 TABLETED CU-0401P (HS149)


MATERIAL CODE HS151                                        MATERIAL CODE HS151

       CLASSIFICATION  1        -0.000 CAT, COPPER CHROMITE
          COMPOSITION  2        -0.000 CR203 43.5, CUO 39, BAO 10
     COST, 2CD ACTIVE  3         0.000 CUO
      AVAILABLE SIZES  4         0.000
     AVAILABLE SHAPES  5        -0.000 POWDER
       CRUSH STRENGTH  6         0.000
             HARDNESS  7         0.000
            PORE SIZE  8         0.000
          PORE VOLUME  9          .760
         SURFACE AREA 10        47.000
         BULK DENSITY 11        30.000
        CRYSTALLINITY 12         0.000
     CRYSTALLITE SIZE 13         0.000
          MAJOR USES  14         0.000
          MAJOR USES  15         0.000
          VOLATILITY  16         0.000
     PARTICLE DENSITY 17         0.000
      MAX. OP. TEMP.  18         0.000
           ATTRITION  19         0.000
            COMMENTS  20         0.000
```

```
MATERIAL CODE HS152                                          MATERIAL CODE HS152

       CLASSIFICATION  1        -0.000 CAT, COPPER CHROMITE
          COMPOSITION  2        -0.000 CR203 38, CUO 33, BAO 9.5
     COST, 2CD ACTIVE  3         0.000 CUO
      AVAILABLE SIZES  4        -0.000 1/8X1/8 INCH
     AVAILABLE SHAPES  5        -0.000 TABLETS
       CRUSH STRENGTH  6        16.000
             HARDNESS  7         0.000
            PORE SIZE  8         0.000
          PORE VOLUME  9         0.000
         SURFACE AREA 10         0.000
         BULK DENSITY 11       113.000
        CRYSTALLINITY 12         0.000
     CRYSTALLITE SIZE 13         0.000
           MAJOR USES 14         0.000
           MAJOR USES 15         0.000
           VOLATILITY 16         0.000
     PARTICLE DENSITY 17         0.000
       MAX. OP. TEMP. 18         0.000
            ATTRITION 19         0.000
             COMMENTS 20        -0.000 TABLETED CU-1106P (HS151)


MATERIAL CODE HS153                                          MATERIAL CODE HS153

       CLASSIFICATION  1        -0.000 CAT, COPPER CHROMITE
          COMPOSITION  2        -0.000 CR203 46, CUO 41, BAO 9
     COST, 2CD ACTIVE  3         0.000 CUO
      AVAILABLE SIZES  4         0.000
     AVAILABLE SHAPES  5        -0.000 POWDER
       CRUSH STRENGTH  6         0.000
             HARDNESS  7         0.000
            PORE SIZE  8         0.000
          PORE VOLUME  9          .020
         SURFACE AREA 10         1.000
         BULK DENSITY 11        41.000
        CRYSTALLINITY 12         0.000
     CRYSTALLITE SIZE 13         0.000
           MAJOR USES 14         0.000
           MAJOR USES 15         0.000
           VOLATILITY 16         0.000
     PARTICLE DENSITY 17         0.000
       MAX. OP. TEMP. 18         0.000
            ATTRITION 19         0.000
             COMMENTS 20         0.000
```

```
MATERIAL CODE HS154                                     MATERIAL CODE HS154

       CLASSIFICATION  1          -0.000 CAT, COPPER CHROMITE
          COMPOSITION  2          -0.000 CR203 60, CUO 40
     COST, 2CD ACTIVE  3           0.000 CUO
      AVAILABLE SIZES  4           0.000
     AVAILABLE SHAPES  5          -0.000 POWDER
       CRUSH STRENGTH  6           0.000
             HARDNESS  7           0.000
            PORE SIZE  8           0.000
          PORE VOLUME  9            .690
         SURFACE AREA 10          10.000
         BULK DENSITY 11          73.000
       CRYSTALLINITY  12           0.000
     CRYSTALLITE SIZE 13           0.000
           MAJOR USES 14           0.000
           MAJOR USES 15           0.000
           VOLATILITY 16           0.000
     PARTICLE DENSITY 17           0.000
       MAX. OP. TEMP. 18           0.000
            ATTRITION 19           0.000
             COMMENTS 20           0.000

MATERIAL CODE HS156                                     MATERIAL CODE HS156

       CLASSIFICATION  1          -0.000 CAT, COPPER CHROMITE
          COMPOSITION  2          -0.000 CUO 51, CR203 47
     COST, 2CD ACTIVE  3           0.000 CR203
      AVAILABLE SIZES  4           0.000
     AVAILABLE SHAPES  5          -0.000 POWDER
       CRUSH STRENGTH  6           0.000
             HARDNESS  7           0.000
            PORE SIZE  8           0.000
          PORE VOLUME  9            .760
         SURFACE AREA 10          37.000
         BULK DENSITY 11          41.000
       CRYSTALLINITY  12           0.000
     CRYSTALLITE SIZE 13           0.000
           MAJOR USES 14           0.000
           MAJOR USES 15           0.000
           VOLATILITY 16           0.000
     PARTICLE DENSITY 17           0.000
       MAX. OP. TEMP. 18           0.000
            ATTRITION 19           0.000
             COMMENTS 20           0.000
```

```
MATERIAL CODE HS157                                         MATERIAL CODE HS157

      CLASSIFICATION  1        -0.000 CAT, COPPER CHROMITE
         COMPOSITION  2        -0.000 CUO 42, CR203 38
    COST, 2CD ACTIVE  3         0.000 CR203
     AVAILABLE SIZES  4         0.000
    AVAILABLE SHAPES  5         0.000
      CRUSH STRENGTH  6         8.000
            HARDNESS  7         0.000
           PORE SIZE  8         0.000
         PORE VOLUME  9         0.000
        SURFACE AREA 10         0.000
        BULK DENSITY 11        83.000
       CRYSTALLINITY 12         0.000
    CRYSTALLITE SIZE 13         0.000
          MAJOR USES 14         0.000
          MAJOR USES 15         0.000
          VOLATILITY 16         0.000
    PARTICLE DENSITY 17         0.000
      MAX. OP. TEMP. 18         0.000
           ATTRITION 19         0.000
            COMMENTS 20        -0.000 TABLETED CU-1800P (HS156)


MATERIAL CODE HS158                                         MATERIAL CODE HS158

      CLASSIFICATION  1        -0.000 CAT, COPPER CHROMITE
         COMPOSITION  2        -0.000 CUO 54, CR203 41
    COST, 2CD ACTIVE  3         0.000 CR203
     AVAILABLE SIZES  4         0.000
    AVAILABLE SHAPES  5        -0.000 POWDER
      CRUSH STRENGTH  6         0.000
            HARDNESS  7         0.000
           PORE SIZE  8         0.000
         PORE VOLUME  9         1.130
        SURFACE AREA 10        35.000
        BULK DENSITY 11        38.000
       CRYSTALLINITY 12         0.000
    CRYSTALLITE SIZE 13         0.000
          MAJOR USES 14         0.000
          MAJOR USES 15         0.000
          VOLATILITY 16         0.000
    PARTICLE DENSITY 17         0.000
      MAX. OP. TEMP. 18         0.000
           ATTRITION 19         0.000
            COMMENTS 20         0.000
```

```
MATERIAL CODE HS159                                          MATERIAL CODE HS159

          CLASSIFICATION  1      -0.000 CAT, COPPER
             COMPOSITION  2      -0.000 CUO 99%
        COST, 2CD ACTIVE  3       0.000 NONE
         AVAILABLE SIZES  4      -0.000 1/8X1/8 INCH
        AVAILABLE SHAPES  5      -0.000 TABLETS (BLACK)
          CRUSH STRENGTH  6      23.000
                HARDNESS  7       0.000
               PORE SIZE  8       0.000
             PORE VOLUME  9        .260
            SURFACE AREA 10       5.000
            BULK DENSITY 11      85.000
          CRYSTALLINITY  12       0.000
        CRYSTALLITE SIZE 13       0.000
              MAJOR USES 14      -0.000 REMOVE O2 + H2 FROM GAS STREAM
              MAJOR USES 15       0.000
              VOLATILITY 16       0.000
        PARTICLE DENSITY 17       0.000
          MAX. OP. TEMP. 18       0.000
               ATTRITION 19       0.000
                COMMENTS 20       0.000


MATERIAL CODE HS160                                          MATERIAL CODE HS160

          CLASSIFICATION  1      -0.000 CAT, COPPER ON ALUMINA
             COMPOSITION  2      -0.000 CUO 10%, BAL. ACTIVATED AL2O3
        COST, 2CD ACTIVE  3       0.000 NONE
         AVAILABLE SIZES  4      -0.000 1/8X1/8 INCH
        AVAILABLE SHAPES  5      -0.000 TABLETS
          CRUSH STRENGTH  6      28.000
                HARDNESS  7       0.000
               PORE SIZE  8       0.000
             PORE VOLUME  9        .420
            SURFACE AREA 10     137.000
            BULK DENSITY 11      53.000
          CRYSTALLINITY  12       0.000
        CRYSTALLITE SIZE 13       0.000
              MAJOR USES 14      -0.000 REMOVAL OF TRACE AMOUNTS OF O2
              MAJOR USES 15      -0.000 FROM GAS STREAMS.
              VOLATILITY 16       0.000
        PARTICLE DENSITY 17       0.000
          MAX. OP. TEMP. 18       0.000
               ATTRITION 19       0.000
                COMMENTS 20       0.000
```

```
MATERIAL CODE HS161                                      MATERIAL CODE HS161

         CLASSIFICATION  1         -0.000 CAT, COPPER ON ALUMINA
            COMPOSITION  2         -0.000 CU 7.7%, BAL. ACTIVATED AL203
       COST, 2CD ACTIVE  3          0.000 NONE
        AVAILABLE SIZES  4         -0.000 1/4X1/4 INCH
       AVAILABLE SHAPES  5         -0.000 TABLETS (WHITE)
         CRUSH STRENGTH  6         19.000
               HARDNESS  7          0.000
              PORE SIZE  8          0.000
            PORE VOLUME  9           .360
           SURFACE AREA 10        100.000
           BULK DENSITY 11         56.000
         CRYSTALLINITY 12           0.000
       CRYSTALLITE SIZE 13          0.000
             MAJOR USES 14         -0.000 CHLORINATION
             MAJOR USES 15          0.000
             VOLATILITY 16          0.000
       PARTICLE DENSITY 17          0.000
         MAX. OP. TEMP. 18          0.000
              ATTRITION 19          0.000
               COMMENTS 20          0.000


MATERIAL CODE HS162                                      MATERIAL CODE HS162

         CLASSIFICATION  1         -0.000 CAT, COPPER ON ALUMINA
            COMPOSITION  2         -0.000 CUCL2 10,BAL. ACTIVATED AL203P
       COST, 2CD ACTIVE  3          0.000 NONE
        AVAILABLE SIZES  4          0.000
       AVAILABLE SHAPES  5         -0.000 POWDER
         CRUSH STRENGTH  6          0.000
               HARDNESS  7          0.000
              PORE SIZE  8          0.000
            PORE VOLUME  9          0.000
           SURFACE AREA 10        180.000
           BULK DENSITY 11         60.000
         CRYSTALLINITY 12           0.000
       CRYSTALLITE SIZE 13          0.000
             MAJOR USES 14         -0.000 CHLORINATION CATALYST
             MAJOR USES 15          0.000
             VOLATILITY 16          0.000
       PARTICLE DENSITY 17          0.000
         MAX. OP. TEMP. 18          0.000
              ATTRITION 19          0.000
               COMMENTS 20          0.000
```

```
MATERIAL CODE HS163                                        MATERIAL CODE HS163

          CLASSIFICATION  1       -0.000 CAT, COPPER ON ALUMINA
             COMPOSITION  2       -0.000 CUCL2 10, BAL. ACTIVATED AL2O3
        COST, 2CD ACTIVE  3        0.000 NONE
         AVAILABLE SIZES  4       -0.000 1/8X1/8 INCH
        AVAILABLE SHAPES  5       -0.000 TABLETS
          CRUSH STRENGTH  6       11.000
                HARDNESS  7        0.000
               PORE SIZE  8        0.000
             PORE VOLUME  9         .260
            SURFACE AREA 10       59.000
            BULK DENSITY 11       60.000
           CRYSTALLINITY 12        0.000
         CRYSTALLITE SIZE 13       0.000
              MAJOR USES 14       -0.000 CHLORINATION CATALYST
              MAJOR USES 15        0.000
              VOLATILITY 16        0.000
        PARTICLE DENSITY 17        0.000
          MAX. OP. TEMP. 18        0.000
               ATTRITION 19        0.000
                COMMENTS 20        0.000


MATERIAL CODE HS164                                        MATERIAL CODE HS164

          CLASSIFICATION  1       -0.000 CAT, COPPER
             COMPOSITION  2       -0.000 CUO 79%
        COST, 2CD ACTIVE  3        0.000 NOT GIVEN
         AVAILABLE SIZES  4       -0.000 1/8X1/8 INCH
        AVAILABLE SHAPES  5       -0.000 TABLETS (BLACK)
          CRUSH STRENGTH  6       19.000
                HARDNESS  7        0.000
               PORE SIZE  8        0.000
             PORE VOLUME  9         .140
            SURFACE AREA 10        8.000
            BULK DENSITY 11      105.000
           CRYSTALLINITY 12        0.000
         CRYSTALLITE SIZE 13       0.000
              MAJOR USES 14       -0.000 CONVERT ALDEHYDES TO ALCOHOLS,
              MAJOR USES 15       -0.000 REMOVE TRACE GASES (O2,CO,H2)
              VOLATILITY 16        0.000
        PARTICLE DENSITY 17        0.000
          MAX. OP. TEMP. 18        0.000
               ATTRITION 19        0.000
                COMMENTS 20        0.000
```

```
MATERIAL CODE HS165                                          MATERIAL CODE HS165

       CLASSIFICATION  1        -0.000 CAT, COPPER ON SILICA
          COMPOSITION  2        -0.000 CU2CO3 6%, BALANCE SIO2
     COST, 2CD ACTIVE  3         0.000 NONE
      AVAILABLE SIZES  4        -0.000 4-10 MESH
     AVAILABLE SHAPES  5        -0.000 GRANULES
       CRUSH STRENGTH  6         0.000
             HARDNESS  7         0.000
            PORE SIZE  8         0.000
          PORE VOLUME  9          .610
        SURFACE AREA 10          4.000
        BULK DENSITY 11         30.000
      CRYSTALLINITY 12           0.000
   CRYSTALLITE SIZE 13           0.000
          MAJOR USES 14         -0.000 DEHYDROGENATE ALCOHOLS TO
          MAJOR USES 15         -0.000 ALDEHYDES OR KETONES.
          VOLATILITY 16          0.000
    PARTICLE DENSITY 17          0.000
      MAX. OP. TEMP. 18          0.000
           ATTRITION 19          0.000
            COMMENTS 20          0.000

MATERIAL CODE HS166                                          MATERIAL CODE HS166

       CLASSIFICATION  1        -0.000 CAT, IRON OXIDE ON ALUMINA
          COMPOSITION  2        -0.000 FE2O3 20, BAL. ACTIVATED AL2O3
     COST, 2CD ACTIVE  3         0.000 NONE
      AVAILABLE SIZES  4        -0.000 1/8X1/8 INCH
     AVAILABLE SHAPES  5        -0.000 TABLETS
       CRUSH STRENGTH  6        18.000
             HARDNESS  7         0.000
            PORE SIZE  8         0.000
          PORE VOLUME  9          .310
        SURFACE AREA 10         41.000
        BULK DENSITY 11         62.000
      CRYSTALLINITY 12           0.000
   CRYSTALLITE SIZE 13           0.000
          MAJOR USES 14         -0.000 DEHYDROGENATION CATALYST
          MAJOR USES 15          0.000
          VOLATILITY 16          0.000
    PARTICLE DENSITY 17          0.000
      MAX. OP. TEMP. 18          0.000
           ATTRITION 19          0.000
            COMMENTS 20          0.000
```

```
MATERIAL CODE HS167                                          MATERIAL CODE HS167

    CLASSIFICATION  1        -0.000 CAT, IRON OXIDE ON ALUMINA
       COMPOSITION  2        -0.000 FE2O3 20. BAL. ACTIVATED AL2O3
  COST, 2CD ACTIVE  3         0.000 NONE
   AVAILABLE SIZES  4        -0.000 MICROSPHEROIDAL
  AVAILABLE SHAPES  5        -0.000 POWDER
    CRUSH STRENGTH  6         0.000
          HARDNESS  7         0.000
         PORE SIZE  8         0.000
       PORE VOLUME  9          .490
      SURFACE AREA 10       105.000
      BULK DENSITY 11        68.000
     CRYSTALLINITY 12         0.000
  CRYSTALLITE SIZE 13         0.000
        MAJOR USES 14        -0.000 FLUID-BED HYDROGENATION CAT.
        MAJOR USES 15         0.000
        VOLATILITY 16         0.000
  PARTICLE DENSITY 17         0.000
    MAX. OP. TEMP. 18         0.000
         ATTRITION 19         0.000
          COMMENTS 20         0.000


MATERIAL CODE HS171                                          MATERIAL CODE HS171

    CLASSIFICATION  1        -0.000 CAT, MANGANESE OXIDE ON SILICA
       COMPOSITION  2        -0.000 MNO2 2%, BALANCE SIO2
  COST, 2CD ACTIVE  3         0.000 NONE
   AVAILABLE SIZES  4        -0.000 3-8 MESH
  AVAILABLE SHAPES  5        -0.000 GRANULES (BROWNISH-BLACK)
    CRUSH STRENGTH  6         0.000
          HARDNESS  7         0.000
         PORE SIZE  8         0.000
       PORE VOLUME  9          .970
      SURFACE AREA 10       258.000
      BULK DENSITY 11        30.000
     CRYSTALLINITY 12         0.000
  CRYSTALLITE SIZE 13         0.000
        MAJOR USES 14        -0.000 OXIDATION CATALYST
        MAJOR USES 15         0.000
        VOLATILITY 16         0.000
  PARTICLE DENSITY 17         0.000
    MAX. OP. TEMP. 18         0.000
         ATTRITION 19         0.000
          COMMENTS 20         0.000
```

```
MATERIAL CODE HS173                                            MATERIAL CODE HS173

       CLASSIFICATION  1        -0.000 CAT, MOLYBDENA ON ALUMINA
          COMPOSITION  2        -0.000 MOO3 10, BAL. ACTIVATED AL2O3
     COST, 2CD ACTIVE  3         0.000 NONE
      AVAILABLE SIZES  4        -0.000 1/8X1/8 INCH
     AVAILABLE SHAPES  5        -0.000 TABLETS (GRAY)
       CRUSH STRENGTH  6        10.000
             HARDNESS  7         0.000
            PORE SIZE  8         0.000
          PORE VOLUME  9          .400
         SURFACE AREA 10        64.000
         BULK DENSITY 11        61.000
        CRYSTALLINITY 12         0.000
     CRYSTALLITE SIZE 13         0.000
           MAJOR USES 14        -0.000 DEHYDROGENATION
           MAJOR USES 15         0.000
           VOLATILITY 16         0.000
     PARTICLE DENSITY 17         0.000
       MAX. OP. TEMP. 18         0.000
            ATTRITION 19         0.000
             COMMENTS 20         0.000


MATERIAL CODE HS174                                            MATERIAL CODE HS174

       CLASSIFICATION  1        -0.000 CAT, MOLYBDENA ON ALUMINA
          COMPOSITION  2        -0.000 MOO3 11, BAL. ACTIVATED AL2O3
     COST, 2CD ACTIVE  3         0.000 NONE
      AVAILABLE SIZES  4         0.000
     AVAILABLE SHAPES  5        -0.000 POWDER (MICROSPHEROIDAL--GRAY)
       CRUSH STRENGTH  6         0.000
             HARDNESS  7         0.000
            PORE SIZE  8         0.000
          PORE VOLUME  9         0.000
         SURFACE AREA 10         0.000
         BULK DENSITY 11        68.000
        CRYSTALLINITY 12         0.000
     CRYSTALLITE SIZE 13         0.000
           MAJOR USES 14        -0.000 FLUID BED HYDROFORMING AND DE-
           MAJOR USES 15        -0.000 HYDROGENATION.
           VOLATILITY 16         0.000
     PARTICLE DENSITY 17         0.000
       MAX. OP. TEMP. 18         0.000
            ATTRITION 19         0.000
             COMMENTS 20         0.000
```

```
MATERIAL CODE HS175                                    MATERIAL CODE HS175

      CLASSIFICATION  1       -0.000 CAT, MOLYBDENA ON ALUMINA
         COMPOSITION  2       -0.000 MOO3 10, BAL. ACTIVATED AL203
    COST, 2CD ACTIVE  3        0.000 NONE
     AVAILABLE SIZES  4       -0.000 1/8X1/8 INCH
    AVAILABLE SHAPES  5       -0.000 TABLETS (GRAY)
      CRUSH STRENGTH  6       19.000
            HARDNESS  7        0.000
           PORE SIZE  8        0.000
         PORE VOLUME  9         .360
        SURFACE AREA 10      160.000
        BULK DENSITY 11       53.000
       CRYSTALLINITY 12        0.000
    CRYSTALLITE SIZE 13        0.000
          MAJOR USES 14       -0.000 HYDRO + DEHYDROGENATION ,ALSO
          MAJOR USES 15       -0.000 HYDROFORMING.
          VOLATILITY 16        0.000
    PARTICLE DENSITY 17        0.000
      MAX. OP. TEMP. 18        0.000
           ATTRITION 19        0.000
            COMMENTS 20        0.000


MATERIAL CODE HS176                                    MATERIAL CODE HS176

      CLASSIFICATION  1       -0.000 CAT, NICKEL HYDRATE,KIESELGUHR
         COMPOSITION  2       -0.000 NI 44(HYDRATE),BAL. KIESELGUHR
    COST, 2CD ACTIVE  3        0.000 NONE
     AVAILABLE SIZES  4       -0.000 1/8,3/16,+1/4 IN.(DIA.,LENGTH)
    AVAILABLE SHAPES  5       -0.000 TABLETS (GREEN)
      CRUSH STRENGTH  6       17.000
            HARDNESS  7        0.000
           PORE SIZE  8        0.000
         PORE VOLUME  9        0.000
        SURFACE AREA 10        0.000
        BULK DENSITY 11       85.000
       CRYSTALLINITY 12        0.000
    CRYSTALLITE SIZE 13        0.000
          MAJOR USES 14       -0.000 HYDROGENATION + METHANATION
          MAJOR USES 15        0.000
          VOLATILITY 16        0.000
    PARTICLE DENSITY 17        0.000
      MAX. OP. TEMP. 18        0.000
           ATTRITION 19        0.000
            COMMENTS 20        0.000
```

```
MATERIAL CODE HS177                                    MATERIAL CODE HS177

        CLASSIFICATION  1        -0.000 CAT,NICKEL OXIDE ON KIESELGUHR
           COMPOSITION  2        -0.000 NIO 55, BALANCE KIESELGUHR
      COST, 2CD ACTIVE  3         0.000 NONE
       AVAILABLE SIZES  4        -0.000 1/8,3/16,+1/4 IN.(DIA.,LENGTH)
      AVAILABLE SHAPES  5        -0.000 TABLETS (DARK GRAY)
        CRUSH STRENGTH  6        25.000 DEPENDS ON SIZE (10-25 LBS.)
              HARDNESS  7         0.000
             PORE SIZE  8         0.000
           PORE VOLUME  9         0.000
          SURFACE AREA 10         0.000
          BULK DENSITY 11       104.000 DEPENDS ON SIZE (94-104  1FT3)
        CRYSTALLINITY 12          0.000
     CRYSTALLITE SIZE 13          0.000
           MAJOR USES 14         -0.000 HYDROGENATION CATALYST
           MAJOR USES 15          0.000
           VOLATILITY 16          0.000
     PARTICLE DENSITY 17          0.000
       MAX. OP. TEMP. 18          0.000
            ATTRITION 19          0.000
             COMMENTS 20         -0.000 MUST BE REDUCED BEFORE USE

MATERIAL CODE HS178                                    MATERIAL CODE HS178

        CLASSIFICATION  1        -0.000 CAT, NICKEL ON KIESELGUHR
           COMPOSITION  2        -0.000 NI 60, BALANCE KIESELGUHR
      COST, 2CD ACTIVE  3         0.000 NONE
       AVAILABLE SIZES  4         0.000
      AVAILABLE SHAPES  5        -0.000 GRANULES
        CRUSH STRENGTH  6         0.000
              HARDNESS  7         0.000
             PORE SIZE  8         0.000
           PORE VOLUME  9          .350
          SURFACE AREA 10       110.000
          BULK DENSITY 11        65.000
        CRYSTALLINITY 12          0.000
     CRYSTALLITE SIZE 13          0.000
           MAJOR USES 14         -0.000 HYDROGENATION CAT. FOR TRICKLE
           MAJOR USES 15         -0.000 BED OR LIQUID PHASE REACTIONS.
           VOLATILITY 16          0.000
     PARTICLE DENSITY 17          0.000
       MAX. OP. TEMP. 18          0.000
            ATTRITION 19          0.000
             COMMENTS 20         -0.000 NOT PYROPHORIC AS SHIPPED.
```

```
MATERIAL CODE HS179                                   MATERIAL CODE HS179

        CLASSIFICATION  1       -0.000 CAT, NICKEL ON KIESELGUHR
           COMPOSITION  2       -0.000 NI 58, BALANCE KIESELGUHR
      COST, 2CD ACTIVE  3        0.000 NONE
       AVAILABLE SIZES  4        0.000
      AVAILABLE SHAPES  5       -0.000 POWDER
        CRUSH STRENGTH  6        0.000
              HARDNESS  7        0.000
             PORE SIZE  8        0.000
           PORE VOLUME  9        0.000
          SURFACE AREA 10      165.000
          BULK DENSITY 11       70.000
        CRYSTALLINITY 12         0.000
      CRYSTALLITE SIZE 13        0.000
            MAJOR USES 14       -0.000 HYDROGENATION CATALYST
            MAJOR USES 15        0.000
            VOLATILITY 16        0.000
      PARTICLE DENSITY 17        0.000
        MAX. OP. TEMP. 18        0.000
             ATTRITION 19        0.000
              COMMENTS 20       -0.000 NOT PYROPHORIC AS SHIPPED


MATERIAL CODE HS180                                   MATERIAL CODE HS180

        CLASSIFICATION  1       -0.000 CAT, NICKEL ON KIESELGUHR
           COMPOSITION  2       -0.000 NI 58, BAL. KIESELGUHR
      COST, 2CD ACTIVE  3        0.000 NONE
       AVAILABLE SIZES  4       -0.000 1/8X1/8 INCH
      AVAILABLE SHAPES  5       -0.000 TABLETS
        CRUSH STRENGTH  6        9.000
              HARDNESS  7        0.000
             PORE SIZE  8        0.000
           PORE VOLUME  9        0.000
          SURFACE AREA 10      165.000
          BULK DENSITY 11       90.000
         CRYSTALLINITY 12        0.000
      CRYSTALLITE SIZE 13        0.000
            MAJOR USES 14        0.000
            MAJOR USES 15        0.000
            VOLATILITY 16        0.000
      PARTICLE DENSITY 17        0.000
        MAX. OP. TEMP. 18        0.000
             ATTRITION 19        0.000
              COMMENTS 20       -0.000 TABLETED FORM OF NI-0104P
```

```
MATERIAL CODE HS181                                             MATERIAL CODE HS181

         CLASSIFICATION  1        -0.000 CAT, NICKEL ON KIESELGUHR
            COMPOSITION  2        -0.000 NI 56, BALANCE KIESELGUHR
      COST, 2CD ACTIVE   3         0.000 NONE
        AVAILABLE SIZES  4        -0.000 5/32 IN. DIA. X 1/8 IN. LONG
       AVAILABLE SHAPES  5        -0.000 TABLETS
         CRUSH STRENGTH  6        10.000
               HARDNESS  7         0.000
              PORE SIZE  8         0.000
            PORE VOLUME  9          .180
           SURFACE AREA 10       130.000
           BULK DENSITY 11        90.000
          CRYSTALLINITY 12         0.000
       CRYSTALLITE SIZE 13         0.000
            MAJOR USES  14        -0.000 HYDROGENATION CAT. (PARTIALLY
            MAJOR USES  15        -0.000 REDUCED + STABILIZED)
             VOLATILITY 16         0.000
       PARTICLE DENSITY 17         0.000
         MAX. OP. TEMP. 18         0.000
              ATTRITION 19         0.000
               COMMENTS 20         0.000


MATERIAL CODE HS182                                             MATERIAL CODE HS182

         CLASSIFICATION  1        -0.000 CAT, NICKEL OXIDE, KIESELGUHR
            COMPOSITION  2        -0.000 NIO 66, BALANCE KIESELGUHR
      COST, 2CD ACTIVE   3         0.000 NONE
        AVAILABLE SIZES  4        -0.000 1/4 X 1/4 INCH
       AVAILABLE SHAPES  5        -0.000 TABLETS
         CRUSH STRENGTH  6        16.000
               HARDNESS  7         0.000
              PORE SIZE  8         0.000
            PORE VOLUME  9         0.000
           SURFACE AREA 10         0.000
           BULK DENSITY 11        77.000
          CRYSTALLINITY 12         0.000
       CRYSTALLITE SIZE 13         0.000
            MAJOR USES  14        -0.000 HYDROGENATION CAT. (UNREDUCED)
            MAJOR USES  15         0.000
             VOLATILITY 16         0.000
       PARTICLE DENSITY 17         0.000
         MAX. OP. TEMP. 18         0.000
              ATTRITION 19         0.000
               COMMENTS 20        -0.000 MUST BE REDUCED BEFORE USE.
```

```
MATERIAL CODE HS183                                    MATERIAL CODE HS183

      CLASSIFICATION  1        -0.000 CAT, NICKEL ON KIESELGUHR
         COMPOSITION  2        -0.000 NI 30, BALANCE KIESELGUHR
    COST, 2CD ACTIVE  3         0.000 NONE
     AVAILABLE SIZES  4         0.000
    AVAILABLE SHAPES  5        -0.000 FLAKE (PROTECTED,HARDENED OIL)
      CRUSH STRENGTH  6         0.000
            HARDNESS  7         0.000
           PORE SIZE  8         0.000
         PORE VOLUME  9         0.000
        SURFACE AREA 10         0.000
        BULK DENSITY 11         0.000
       CRYSTALLINITY 12         0.000
    CRYSTALLITE SIZE 13         0.000
          MAJOR USES 14        -0.000 FOR CERTAIN SPECIFIC PROBLEMS
          MAJOR USES 15        -0.000 IN HARDENING SOME FATTY OILS.
          VOLATILITY 16         0.000
    PARTICLE DENSITY 17         0.000
      MAX. OP. TEMP. 18         0.000
           ATTRITION 19         0.000
            COMMENTS 20        -0.000 CONSULT HARSHAW REP. , DETAILS


MATERIAL CODE HS184                                    MATERIAL CODE HS184

      CLASSIFICATION  1        -0.000 CAT, NICKEL ON KIESELGUHR
         COMPOSITION  2        -0.000 NI 60(REDUCED),BAL. KIESELGUHR
    COST, 2CD ACTIVE  3         0.000 NONE
     AVAILABLE SIZES  4        -0.000 1/4X1/4 INCH
    AVAILABLE SHAPES  5        -0.000 TABLETS (PROTECTED IN LIQUID)
      CRUSH STRENGTH  6        35.000
            HARDNESS  7         0.000
           PORE SIZE  8         0.000
         PORE VOLUME  9         0.000
        SURFACE AREA 10         0.000
        BULK DENSITY 11        84.000
       CRYSTALLINITY 12         0.000
    CRYSTALLITE SIZE 13         0.000
          MAJOR USES 14        -0.000 HYDROGENATION CATALYST
          MAJOR USES 15         0.000
          VOLATILITY 16         0.000
    PARTICLE DENSITY 17         0.000
      MAX. OP. TEMP. 18         0.000
           ATTRITION 19         0.000
            COMMENTS 20        -0.000 PYROPHORIC,SHIPPED IN LIQUID.
```

```
MATERIAL CODE HS185                                        MATERIAL CODE HS185

      CLASSIFICATION  1      -0.000 CAT, NICKEL ON KIESELGUHR
         COMPOSITION  2      -0.000 NI 60, BAL. KIESELGUHR
    COST, 2CD ACTIVE  3       0.000 NONE
     AVAILABLE SIZES  4      -0.000 1/8,3/16,+1/4 IN.(DIA.+LENGTH)
    AVAILABLE SHAPES  5      -0.000 TABLETS
      CRUSH STRENGTH  6      35.000
            HARDNESS  7       0.000
           PORE SIZE  8       0.000
         PORE VOLUME  9        .200
        SURFACE AREA 10     165.000
        BULK DENSITY 11     100.000
       CRYSTALLINITY 12       0.000
    CRYSTALLITE SIZE 13       0.000
          MAJOR USES 14      -0.000 HYDROGENATION CAT.(HIGH PHYSI-
          MAJOR USES 15      -0.000 CAL STRENGTH).
          VOLATILITY 16       0.000
    PARTICLE DENSITY 17       0.000
      MAX. OP. TEMP. 18       0.000
           ATTRITION 19       0.000
            COMMENTS 20      -0.000 NOT PYROPHORIC AS SHIPPED


MATERIAL CODE HS186                                        MATERIAL CODE HS186

      CLASSIFICATION  1      -0.000 CAT, NICKEL ON KIESELGUHR
         COMPOSITION  2      -0.000 NI 28, BALANCE KIESELGUHR
    COST, 2CD ACTIVE  3       0.000 NONE
     AVAILABLE SIZES  4      -0.000 1/16 INCH DIAMETER
    AVAILABLE SHAPES  5      -0.000 EXTRUSION
      CRUSH STRENGTH  6      10.000
            HARDNESS  7       0.000
           PORE SIZE  8       0.000
         PORE VOLUME  9        .530
        SURFACE AREA 10     168.000
        BULK DENSITY 11      45.000
       CRYSTALLINITY 12       0.000
    CRYSTALLITE SIZE 13       0.000
          MAJOR USES 14      -0.000 HYDROGENATION CAT. (ACTIVE BUT
          MAJOR USES 15      -0.000 STABLE).
          VOLATILITY 16       0.000
    PARTICLE DENSITY 17       0.000
      MAX. OP. TEMP. 18       0.000
           ATTRITION 19       0.000
            COMMENTS 20      -0.000 NOT PYROPHORIC AS SHIPPED
```

```
MATERIAL CODE HS187                                      MATERIAL CODE HS187

       CLASSIFICATION  1      -0.000 CAT, NICKEL OXIDE ON ALUMINA
          COMPOSITION  2      -0.000 NIO 11, BAL. ACTIVATED AL203
     COST, 2CD ACTIVE  3       0.000 NONE
      AVAILABLE SIZES  4      -0.000 1/8X1/8 INCH
     AVAILABLE SHAPES  5      -0.000 TABLETS (GRAY)
       CRUSH STRENGTH  6      13.000
             HARDNESS  7       0.000
            PORE SIZE  8       0.000
          PORE VOLUME  9        .320
         SURFACE AREA 10      64.000
         BULK DENSITY 11      68.000
       CRYSTALLINITY  12       0.000
     CRYSTALLITE SIZE 13       0.000
           MAJOR USES 14      -0.000 HYDROGENATION OF DIOLEFINS TO
           MAJOR USES 15      -0.000 MONO-OLEFINS (SULFIDED FORM).
           VOLATILITY 16       0.000
     PARTICLE DENSITY 17       0.000
      MAX. OP. TEMP.  18       0.000
            ATTRITION 19       0.000
             COMMENTS 20       0.000


MATERIAL CODE HS188                                      MATERIAL CODE HS188

       CLASSIFICATION  1      -0.000 CAT, NICKEL OXIDE ON ALUMINA
          COMPOSITION  2      -0.000 NIO 15, BAL. ACTIVATED AL203
     COST, 2CD ACTIVE  3       0.000 NONE
      AVAILABLE SIZES  4      -0.000 1/8X1/8 INCH
     AVAILABLE SHAPES  5      -0.000 TABLETS
       CRUSH STRENGTH  6      17.000
             HARDNESS  7       0.000
            PORE SIZE  8       0.000
          PORE VOLUME  9        .200
         SURFACE AREA 10      65.000
         BULK DENSITY 11      83.000
       CRYSTALLINITY  12       0.000
     CRYSTALLITE SIZE 13       0.000
           MAJOR USES 14      -0.000 HYDROGENATION
           MAJOR USES 15       0.000
           VOLATILITY 16       0.000
     PARTICLE DENSITY 17       0.000
      MAX. OP. TEMP.  18       0.000
            ATTRITION 19       0.000
             COMMENTS 20       0.000
```

```
MATERIAL CODE HS189                                          MATERIAL CODE HS189


      CLASSIFICATION  1        -0.000 CAT, NICKEL ON KIESELGUHR
         COMPOSITION  2        -0.000 NI 24 (REDUCED),BAL.KIESELGUHR
    COST, 2CD ACTIVE  3         0.000 NONE
     AVAILABLE SIZES  4         0.000
    AVAILABLE SHAPES  5        -0.000 FLAKE (PROTECTED,HARDENED OIL)
      CRUSH STRENGTH  6         0.000
            HARDNESS  7         0.000
           PORE SIZE  8         0.000
         PORE VOLUME  9         0.000
        SURFACE AREA 10         0.000
        BULK DENSITY 11        38.000
       CRYSTALLINITY 12         0.000
    CRYSTALLITE SIZE 13         0.000
          MAJOR USES 14        -0.000 HYDROGENATION REACTIONS
          MAJOR USES 15         0.000
          VOLATILITY 16         0.000
    PARTICLE DENSITY 17         0.000
      MAX. OP. TEMP. 18         0.000
           ATTRITION 19         0.000
            COMMENTS 20         0.000


MATERIAL CODE HS190                                          MATERIAL CODE HS190


      CLASSIFICATION  1        -0.000 CAT, NICKEL OXIDE, KIESELGUHR
         COMPOSITION  2        -0.000 NIO 18, BALANCE KIESELGUHR
    COST, 2CD ACTIVE  3         0.000 NONE
     AVAILABLE SIZES  4        -0.000 5/32 INCH DIAMETER
    AVAILABLE SHAPES  5        -0.000 EXTRUSION  (GRAY)
      CRUSH STRENGTH  6        45.000
            HARDNESS  7         0.000
           PORE SIZE  8         0.000
         PORE VOLUME  9          .500
        SURFACE AREA 10         4.000
        BULK DENSITY 11        51.000
       CRYSTALLINITY 12         0.000
    CRYSTALLITE SIZE 13         0.000
          MAJOR USES 14        -0.000 HYDROGENATION REACTIONS
          MAJOR USES 15         0.000
          VOLATILITY 16         0.000
    PARTICLE DENSITY 17         0.000
      MAX. OP. TEMP. 18         0.000
           ATTRITION 19         0.000
            COMMENTS 20         0.000
```

```
MATERIAL CODE HS191                                          MATERIAL CODE HS191

       CLASSIFICATION  1      -0.000 CAT, NICKEL OXIDE ON ALUMINA
          COMPOSITION  2      -0.000 NIO 14, BAL. ACTIVATED AL2O3
     COST, 2CD ACTIVE  3       0.000 NONE
      AVAILABLE SIZES  4      -0.000 1/8X1/8 INCH
     AVAILABLE SHAPES  5      -0.000 TABLETS
       CRUSH STRENGTH  6      22.000
             HARDNESS  7       0.000
            PORE SIZE  8       0.000
          PORE VOLUME  9        .380
         SURFACE AREA 10     140.000
         BULK DENSITY 11      52.000
        CRYSTALLINITY 12       0.000
     CRYSTALLITE SIZE 13       0.000
          MAJOR USES  14      -0.000 HYDROGENATIONS + AMINATIONS.
          MAJOR USES  15       0.000
           VOLATILITY 16       0.000
     PARTICLE DENSITY 17       0.000
      MAX. OP. TEMP.  18       0.000
            ATTRITION 19       0.000
             COMMENTS 20       0.000

MATERIAL CODE HS192                                          MATERIAL CODE HS192

       CLASSIFICATION  1      -0.000 CAT,NICKEL OXIDE ON ALUMINA
          COMPOSITION  2      -0.000 NIO 5,BAL. AL2O3-SIO2 (INERT)
     COST, 2CD ACTIVE  3       0.000 NONE
      AVAILABLE SIZES  4      -0.000 3/8, 1/2, 3/4, + 1.0 INCH
     AVAILABLE SHAPES  5      -0.000 SPHERES
       CRUSH STRENGTH  6       0.000
             HARDNESS  7       0.000
            PORE SIZE  8       0.000
          PORE VOLUME  9       0.000
         SURFACE AREA 10       1.000
         BULK DENSITY 11      75.000
        CRYSTALLINITY 12       0.000
     CRYSTALLITE SIZE 13       0.000
          MAJOR USES  14      -0.000 REFORM LOW MOLECULAR WEIGHT
          MAJOR USES  15      -0.000 HYDROCARBONS.
           VOLATILITY 16       0.000
     PARTICLE DENSITY 17       0.000
      MAX. OP. TEMP.  18       0.000
            ATTRITION 19       0.000
             COMMENTS 20       0.000
```

```
MATERIAL CODE HS193                                         MATERIAL CODE HS193

        CLASSIFICATION  1       -0.000 CAT, NICKEL OXIDE ON ALUMINA
           COMPOSITION  2       -0.000 NIO 10,BAL. AL203-SIO2 (INERT)
     COST, 2CD ACTIVE   3        0.000 NONE
       AVAILABLE SIZES  4       -0.000 1.0 INCH
      AVAILABLE SHAPES  5       -0.000 SPHERES
        CRUSH STRENGTH  6        0.000
              HARDNESS  7        0.000
             PORE SIZE  8        0.000
           PORE VOLUME  9        0.000
          SURFACE AREA 10        1.000
          BULK DENSITY 11       79.000
        CRYSTALLINITY  12        0.000
     CRYSTALLITE SIZE  13        0.000
           MAJOR USES  14       -0.000 REFORM LOW MOLECULAR WEIGHT
           MAJOR USES  15       -0.000 HYDROCARBONS.
           VOLATILITY  16        0.000
     PARTICLE DENSITY  17        0.000
       MAX. OP. TEMP.  18        0.000
            ATTRITION  19        0.000
             COMMENTS  20        0.000


MATERIAL CODE HS194                                         MATERIAL CODE HS194

        CLASSIFICATION  1       -0.000 CAT, NICKEL OXIDE ON ALUMINA
           COMPOSITION  2       -0.000 NIO2 5, BALANCE AL203 (INERT)
     COST, 2CD ACTIVE   3        0.000 NONE
       AVAILABLE SIZES  4       -0.000 1.0 INCH
      AVAILABLE SHAPES  5       -0.000 SPHERES
        CRUSH STRENGTH  6        0.000
              HARDNESS  7        0.000
             PORE SIZE  8        0.000
           PORE VOLUME  9        0.000
          SURFACE AREA 10        1.000
          BULK DENSITY 11       75.000
        CRYSTALLINITY  12        0.000
     CRYSTALLITE SIZE  13        0.000
           MAJOR USES  14       -0.000 GAS REFORMING CATALYST
           MAJOR USES  15        0.000
           VOLATILITY  16        0.000
     PARTICLE DENSITY  17        0.000
       MAX. OP. TEMP.  18        0.000
            ATTRITION  19        0.000
             COMMENTS  20        0.000
```

```
MATERIAL CODE HS195                                        MATERIAL CODE HS195

     CLASSIFICATION  1       -0.000 CAT, NICKEL OXIDE ON ALUMINA
        COMPOSITION  2       -0.000 NIO 1.5,BAL, AL2O3-SIO2(INERT)
   COST, 2CD ACTIVE  3        0.000 NONE
    AVAILABLE SIZES  4       -0.000 3/4 INCH
   AVAILABLE SHAPES  5       -0.000 RING  (GRAY)
     CRUSH STRENGTH  6        0.000
           HARDNESS  7        0.000
          PORE SIZE  8        0.000
        PORE VOLUME  9        0.000
       SURFACE AREA 10        1.000
       BULK DENSITY 11       68.000
     CRYSTALLINITY 12         0.000
   CRYSTALLITE SIZE 13        0.000
        MAJOR USES 14        -0.000 USED IN GAS REFORMING
        MAJOR USES 15         0.000
        VOLATILITY 16         0.000
   PARTICLE DENSITY 17        0.000
     MAX. OP. TEMP. 18        0.000
          ATTRITION 19        0.000
           COMMENTS 20        0.000


MATERIAL CODE HS196                                        MATERIAL CODE HS196

     CLASSIFICATION  1       -0.000 CAT, NICKEL,ALUMINUM
        COMPOSITION  2       -0.000 NI 50%, AL 50%
   COST, 2CD ACTIVE  3        0.000 NI,AL
    AVAILABLE SIZES  4       -0.000 325 MESH
   AVAILABLE SHAPES  5       -0.000 POWDER
     CRUSH STRENGTH  6        0.000
           HARDNESS  7        0.000
          PORE SIZE  8        0.000
        PORE VOLUME  9        0.000
       SURFACE AREA 10        0.000
       BULK DENSITY 11      137.000
     CRYSTALLINITY 12         0.000
   CRYSTALLITE SIZE 13        0.000
        MAJOR USES 14        -0.000 PROCESS HYDROGENATIONS IN LOW
        MAJOR USES 15        -0.000 TO MODERATE TEMPERATURE RANGES
        VOLATILITY 16         0.000
   PARTICLE DENSITY 17        0.000
     MAX. OP. TEMP. 18        0.000
          ATTRITION 19        0.000
           COMMENTS 20       -0.000 SUPPLIED INACTIVE
```

```
MATERIAL CODE HS197                                          MATERIAL CODE HS197

      CLASSIFICATION  1       -0.000 CAT, NICKEL CATALYST
         COMPOSITION  2       -0.000 NI 70%, BASE MAT,L PROPRIETARY
    COST, 2CD ACTIVE  3        0.000 NONE
     AVAILABLE SIZES  4       -0.000 1/8 + 3/16 INCH(DIA. + LENGTH)
    AVAILABLE SHAPES  5       -0.000 TABLETS (ACTIVATED,STABLIZED)
      CRUSH STRENGTH  6       10.000
            HARDNESS  7        0.000
           PORE SIZE  8        0.000
         PORE VOLUME  9         .400
        SURFACE AREA 10      132.000
        BULK DENSITY 11       80.000
      CRYSTALLINITY 12         0.000
    CRYSTALLITE SIZE 13        0.000
         MAJOR USES 14        -0.000 HYDROGENATION CATALYST
         MAJOR USES 15         0.000
         VOLATILITY 16         0.000
   PARTICLE DENSITY 17         0.000
     MAX. OP. TEMP. 18         0.000
          ATTRITION 19         0.000
           COMMENTS 20        -0.000 NOT PYROPHORIC AS SHIPPED


MATERIAL CODE HS198                                          MATERIAL CODE HS198

      CLASSIFICATION  1       -0.000 CAT, NICKEL CATALYST
         COMPOSITION  2       -0.000 NI 46%, BASE MAT L PROPRIETARY
    COST, 2CD ACTIVE  3        0.000 NONE
     AVAILABLE SIZES  4       -0.000 5/32 + 7/32 IN.(DIA. + LENGTH)
    AVAILABLE SHAPES  5       -0.000 TABLETS
      CRUSH STRENGTH  6       40.000
            HARDNESS  7        0.000
           PORE SIZE  8        0.000
         PORE VOLUME  9        0.000
        SURFACE AREA 10        0.000
        BULK DENSITY 11       95.000
      CRYSTALLINITY 12         0.000
    CRYSTALLITE SIZE 13        0.000
         MAJOR USES 14        -0.000 HYDROGENATION CATALYST
         MAJOR USES 15         0.000
         VOLATILITY 16         0.000
   PARTICLE DENSITY 17         0.000
     MAX. OP. TEMP. 18         0.000
          ATTRITION 19         0.000
           COMMENTS 20        -0.000 ACTIVATE (REDUCTION)IN SITU
```

```
MATERIAL CODE HS199                                              MATERIAL CODE HS199

       CLASSIFICATION  1      -0.000 CAT, NICKEL ON ALUMINA
          COMPOSITION  2      -0.000 NI 40%, BAL. ACTIVATED AL203
     COST, 2CD ACTIVE  3       0.000 NONE
      AVAILABLE SIZES  4      -0.000 1/16 INCH DIAMETER
     AVAILABLE SHAPES  5      -0.000 EXTRUSION
       CRUSH STRENGTH  6       9.000
             HARDNESS  7       0.000
            PORE SIZE  8       0.000
          PORE VOLUME  9        .690
         SURFACE AREA 10     160.000
         BULK DENSITY 11      40.000
        CRYSTALLINITY 12       0.000
     CRYSTALLITE SIZE 13       0.000
           MAJOR USES 14      -0.000 HYDROGENATION CATALYST
           MAJOR USES 15       0.000
           VOLATILITY 16       0.000
     PARTICLE DENSITY 17       0.000
       MAX. OP. TEMP. 18       0.000
            ATTRITION 19       0.000
             COMMENTS 20      -0.000 NOT PYROPHORIC AS SHIPPED


MATERIAL CODE HS200                                              MATERIAL CODE HS200

       CLASSIFICATION  1      -0.000 CAT, NICKEL OXIDE ON ALUMINA
          COMPOSITION  2      -0.000 NIO 5, MG 1.2, BAL. AL203-SIO2
     COST, 2CD ACTIVE  3       0.000 MG 1.2%
      AVAILABLE SIZES  4      -0.000 1.0 INCH
     AVAILABLE SHAPES  5      -0.000 SPHERES
       CRUSH STRENGTH  6       0.000
             HARDNESS  7       0.000
            PORE SIZE  8       0.000
          PORE VOLUME  9       0.000
         SURFACE AREA 10       1.000
         BULK DENSITY 11      78.000
        CRYSTALLINITY 12       0.000
     CRYSTALLITE SIZE 13       0.000
           MAJOR USES 14      -0.000 A GAS REFORMING CATALYST
           MAJOR USES 15       0.000
           VOLATILITY 16       0.000
     PARTICLE DENSITY 17       0.000
       MAX. OP. TEMP. 18       0.000
            ATTRITION 19       0.000
             COMMENTS 20       0.000
```

```
                                                                   MATERIAL CODE HS201
MATERIAL CODE HS201

       CLASSIFICATION  1      -0.000 CAT, METAL OXIDES ON ALUMINA
          COMPOSITION  2      -0.000 NIO 4,FE203 4,COO 4,AL203-SIO2
     COST, 2CD ACTIVE  3       0.000 FE203,4%, COO 4%
      AVAILABLE SIZES  4      -0.000 1/4 INCH
     AVAILABLE SHAPES  5      -0.000 SPHERES
       CRUSH STRENGTH  6       0.000
             HARDNESS  7       0.000
            PORE SIZE  8       0.000
          PORE VOLUME  9       0.000
         SURFACE AREA 10       1.000
         BULK DENSITY 11      82.000
        CRYSTALLINITY 12       0.000
     CRYSTALLITE SIZE 13       0.000
          MAJOR USES 14       -0.000 DECOMPOSITION CATALYST
          MAJOR USES 15        0.000
          VOLATILITY 16        0.000
    PARTICLE DENSITY 17        0.000
      MAX. OP. TEMP. 18        0.000
           ATTRITION 19        0.000
            COMMENTS 20        0.000

                                                                   MATERIAL CODE HS202
MATERIAL CODE HS202

       CLASSIFICATION  1      -0.000 CAT, METAL OXIDES ON ALUMINA
          COMPOSITION  2      -0.000 NIO 4,FE203 4,COO 4,AL203-SIO2
     COST, 2CD ACTIVE  3       0.000 FE203,4%, COO 4%
      AVAILABLE SIZES  4      -0.000 1/8X1/8 INCH
     AVAILABLE SHAPES  5      -0.000 TABLETS
       CRUSH STRENGTH  6      16.000
             HARDNESS  7       0.000
            PORE SIZE  8       0.000
          PORE VOLUME  9        .280
         SURFACE AREA 10      78.000
         BULK DENSITY 11      62.000
        CRYSTALLINITY 12       0.000
     CRYSTALLITE SIZE 13       0.000
          MAJOR USES 14       -0.000 A DECOMPOSITION CATALYST
          MAJOR USES 15        0.000
          VOLATILITY 16        0.000
    PARTICLE DENSITY 17        0.000
      MAX. OP. TEMP. 18        0.000
           ATTRITION 19        0.000
            COMMENTS 20        0.000
```

```
MATERIAL CODE HS203                                          MATERIAL CODE HS203

          CLASSIFICATION  1      -0.000 CAT, METAL OXIDES ON SILICA
             COMPOSITION  2      -0.000 NIO 10,CUO 1,BAL SIO2
        COST, 2CD ACTIVE  3       0.000 CUO 1%
         AVAILABLE SIZES  4      -0.000 4-6 MESH
        AVAILABLE SHAPES  5      -0.000 GRANULES
          CRUSH STRENGTH  6       0.000
                HARDNESS  7       0.000
               PORE SIZE  8       0.000
             PORE VOLUME  9       0.000
            SURFACE AREA 10       3.000
            BULK DENSITY 11      37.000
          CRYSTALLINITY  12       0.000
        CRYSTALLITE SIZE 13       0.000
              MAJOR USES 14      -0.000 HYDROGENATION CATALYST
              MAJOR USES 15       0.000
              VOLATILITY 16       0.000
        PARTICLE DENSITY 17       0.000
          MAX. OP. TEMP. 18       0.000
               ATTRITION 19       0.000
                COMMENTS 20       0.000


MATERIAL CODE HS204                                          MATERIAL CODE HS204

          CLASSIFICATION  1      -0.000 CAT, NICKEL OXIDE ON ALUMINA
             COMPOSITION  2      -0.000 NIO 3, BAL. ACTIVATED AL203
        COST, 2CD ACTIVE  3       0.000 NONE
         AVAILABLE SIZES  4      -0.000 2-1 MESH
        AVAILABLE SHAPES  5      -0.000 GRANULES
          CRUSH STRENGTH  6       0.000
                HARDNESS  7       0.000
               PORE SIZE  8       0.000
             PORE VOLUME  9       0.000
            SURFACE AREA 10       0.000
            BULK DENSITY 11      53.000
          CRYSTALLINITY  12       0.000
        CRYSTALLITE SIZE 13       0.000
              MAJOR USES 14      -0.000 A GAS REFORMING CATALYST
              MAJOR USES 15       0.000
              VOLATILITY 16       0.000
        PARTICLE DENSITY 17       0.000
          MAX. OP. TEMP. 18       0.000
               ATTRITION 19       0.000
                COMMENTS 20       0.000
```

```
MATERIAL CODE HS205                                              MATERIAL CODE HS205

       CLASSIFICATION  1        -0.000 CAT, NICKEL
          COMPOSITION  2        -0.000 NIO 5, BAL. INERT CUBES
     COST, 2CD ACTIVE  3         0.000 NONE
      AVAILABLE SIZES  4        -0.000 1.0 INCH (SPEC. 102)
     AVAILABLE SHAPES  5        -0.000 CUBES
       CRUSH STRENGTH  6         0.000
             HARDNESS  7         0.000
            PORE SIZE  8         0.000
          PORE VOLUME  9         0.000
         SURFACE AREA 10         0.000
         BULK DENSITY 11        37.500
        CRYSTALLINITY 12         0.000
     CRYSTALLITE SIZE 13         0.000
          MAJOR USES 14         -0.000 GAS REFORMING CATALYST
          MAJOR USES 15          0.000
           VOLATILITY 16         0.000
     PARTICLE DENSITY 17         0.000
       MAX. OP. TEMP. 18         0.000
            ATTRITION 19         0.000
             COMMENTS 20         0.000


MATERIAL CODE HS206                                              MATERIAL CODE HS206

       CLASSIFICATION  1        -0.000 CAT, NICKEL-ALUMINUM
          COMPOSITION  2        -0.000 NI 49%, AL 49%
     COST, 2CD ACTIVE  3         0.000 AL 49%
      AVAILABLE SIZES  4        -0.000 3/16X3/16 INCH
     AVAILABLE SHAPES  5        -0.000 TABLETS
       CRUSH STRENGTH  6       100.000
             HARDNESS  7         0.000
            PORE SIZE  8         0.000
          PORE VOLUME  9         0.000
         SURFACE AREA 10         0.000
         BULK DENSITY 11       135.000
        CRYSTALLINITY 12         0.000
     CRYSTALLITE SIZE 13         0.000
          MAJOR USES 14         -0.000 FOR FIXED BED,LOW-MODERATE
          MAJOR USES 15         -0.000 TEMP. HYDROGENATION REACTIONS.
           VOLATILITY 16         0.000
     PARTICLE DENSITY 17         0.000
       MAX. OP. TEMP. 18         0.000
            ATTRITION 19         0.000
             COMMENTS 20        -0.000 MUST BE ACTIVATED IN SITU.
```

```
MATERIAL CODE HS207                                   MATERIAL CODE HS207

        CLASSIFICATION  1       -0.000 CAT, (NYSEL)
           COMPOSITION  2       -0.000 NI 30(ACTIVE);BASE PROPRIETARY
      COST, 2CD ACTIVE  3        0.000 NONE
       AVAILABLE SIZES  4        0.000
      AVAILABLE SHAPES  5       -0.000 FLAKES(PROTECTED,60% STEARINE)
        CRUSH STRENGTH  6        0.000
              HARDNESS  7        0.000
             PORE SIZE  8        0.000
           PORE VOLUME  9        0.000
          SURFACE AREA 10        0.000
          BULK DENSITY 11        0.000
        CRYSTALLINITY  12        0.000
      CRYSTALLITE SIZE 13        0.000
            MAJOR USES 14       -0.000 SUPERIOR SELECTIVITY IN THE
            MAJOR USES 15       -0.000 HYDROGENATION OF EDIBLE OILS.
            VOLATILITY 16        0.000
      PARTICLE DENSITY 17        0.000
       MAX. OP. TEMP.  18        0.000
             ATTRITION 19        0.000
              COMMENTS 20       -0.000 CONSULT HARSHAW REP.,DETAILS

MATERIAL CODE HS208                                   MATERIAL CODE HS208

        CLASSIFICATION  1       -0.000 CAT, NICKEL FLAKES (RUFERT)
           COMPOSITION  2       -0.000 NI 25% (NO OTHER DATA GIVEN)
      COST, 2CD ACTIVE  3        0.000 NONE
       AVAILABLE SIZES  4        0.000
      AVAILABLE SHAPES  5       -0.000 FLAKES (IN HARDENED OIL)
        CRUSH STRENGTH  6        0.000
              HARDNESS  7        0.000
             PORE SIZE  8        0.000
           PORE VOLUME  9        0.000
          SURFACE AREA 10        0.000
          BULK DENSITY 11        0.000
        CRYSTALLINITY  12        0.000
      CRYSTALLITE SIZE 13        0.000
            MAJOR USES 14       -0.000 HYDROGENATION OF FATTY OILS +
            MAJOR USES 15       -0.000 ACIDS,METHYL ESTERS, ETC.
            VOLATILITY 16        0.000
      PARTICLE DENSITY 17        0.000
       MAX. OP. TEMP.  18        0.000
             ATTRITION 19        0.000
              COMMENTS 20        0.000
```

```
MATERIAL CODE HS209                                         MATERIAL CODE HS209

      CLASSIFICATION  1      -0.000 CAT, NICKEL/TUNGSTEN
         COMPOSITION  2      -0.000 NI 6,W 19,BAL. SIO2/AL203
    COST, 2CD ACTIVE  3       0.000 NI 6%
     AVAILABLE SIZES  4      -0.000 1/12 INCH DIAMETER
    AVAILABLE SHAPES  5      -0.000 EXTRUSION
      CRUSH STRENGTH  6      14.000
            HARDNESS  7       0.000
           PORE SIZE  8       0.000
         PORE VOLUME  9        .370
        SURFACE AREA 10     228.000
        BULK DENSITY 11       0.000
       CRYSTALLINITY 12       0.000
    CRYSTALLITE SIZE 13       0.000
          MAJOR USES 14      -0.000 SULFIDE FORM:CRACKING FUNCTION
          MAJOR USES 15      -0.000 DE-NITROGENATION/SULFURIZATION
          VOLATILITY 16       0.000
    PARTICLE DENSITY 17       0.000
      MAX. OP. TEMP. 18       0.000
           ATTRITION 19       0.000
            COMMENTS 20       0.000


MATERIAL CODE HS210                                         MATERIAL CODE HS210

      CLASSIFICATION  1      -0.000 CAT, NICKEL/TUNGSTEN SULFIDE
         COMPOSITION  2      -0.000 NOT GIVEN (SEE COMMENTS)
    COST, 2CD ACTIVE  3       0.000 NIS 6%
     AVAILABLE SIZES  4      -0.000 1/12 INCH DIAMETER
    AVAILABLE SHAPES  5      -0.000 EXTRUSION
      CRUSH STRENGTH  6      10.000
            HARDNESS  7       0.000
           PORE SIZE  8       0.000
         PORE VOLUME  9        .390
        SURFACE AREA 10     212.000
        BULK DENSITY 11      59.000
       CRYSTALLINITY 12       0.000
    CRYSTALLITE SIZE 13       0.000
          MAJOR USES 14       0.000
          MAJOR USES 15       0.000
          VOLATILITY 16       0.000
    PARTICLE DENSITY 17       0.000
      MAX. OP. TEMP. 18       0.000
           ATTRITION 19       0.000
            COMMENTS 20      -0.000 SULFIDED FORM OF HS209
```

```
                                                   MATERIAL CODE HS211
MATERIAL CODE HS211

     CLASSIFICATION  1       -0.000 CAT, NICKEL/TUNGSTEN SULFIDE
        COMPOSITION  2       -0.000 NOT GIVEN (SEE COMMENTS)
   COST, 2CD ACTIVE  3        0.000 NIS 6%
    AVAILABLE SIZES  4       -0.000 1/12 INCH DIAMETER
   AVAILABLE SHAPES  5       -0.000 EXTRUSION
     CRUSH STRENGTH  6       18.000
           HARDNESS  7        0.000
          PORE SIZE  8        0.000
        PORE VOLUME  9         .480
      SURFACE AREA  10      140.000
      BULK DENSITY  11       50.000
     CRYSTALLINITY  12        0.000
  CRYSTALLITE SIZE  13        0.000
        MAJOR USES  14        0.000
        MAJOR USES  15        0.000
        VOLATILITY  16        0.000
  PARTICLE DENSITY  17        0.000
    MAX. OP. TEMP.  18        0.000
         ATTRITION  19        0.000
          COMMENTS  20       -0.000 SULFIDED FORM OF HS212

                                                   MATERIAL CODE HS212
MATERIAL CODE HS212

     CLASSIFICATION  1       -0.000 CAT,NICKEL/TUNGSTEN ON ALUMINA
        COMPOSITION  2       -0.000 NI 6,W 19, BALANCE AL203
   COST, 2CD ACTIVE  3        0.000 NI 6%
    AVAILABLE SIZES  4       -0.000 1/12 INCH DIAMETER
   AVAILABLE SHAPES  5       -0.000 EXTRUSION
     CRUSH STRENGTH  6       17.000
           HARDNESS  7        0.000
          PORE SIZE  8        0.000
        PORE VOLUME  9         .540
      SURFACE AREA  10      152.000
      BULK DENSITY  11       49.000
     CRYSTALLINITY  12        0.000
  CRYSTALLITE SIZE  13        0.000
        MAJOR USES  14       -0.000 DE-NITROGENATION/SULFURIZATION
        MAJOR USES  15       -0.000 ,SATURATION AROMATIC COMPOUNDS
        VOLATILITY  16        0.000
  PARTICLE DENSITY  17        0.000
    MAX. OP. TEMP.  18        0.000
         ATTRITION  19        0.000
          COMMENTS  20        0.000
```

```
MATERIAL CODE HS213                                              MATERIAL CODE HS213

        CLASSIFICATION  1        -0.000 CAT,NICKEL/TUNGSTEN ON ALUMINA
           COMPOSITION  2        -0.000 NI 4.5,W 9.5, BALANCE AL2O3
     COST, 2CD ACTIVE   3         0.000 NI 4.5%
       AVAILABLE SIZES  4        -0.000 1/8 INCH DIAMETER
      AVAILABLE SHAPES  5        -0.000 EXTRUSION
        CRUSH STRENGTH  6        15.000
              HARDNESS  7         0.000
             PORE SIZE  8         0.000
           PORE VOLUME  9          .530
         SURFACE AREA 10        184.000
         BULK DENSITY 11         64.000
        CRYSTALLINITY 12          0.000
     CRYSTALLITE SIZE 13          0.000
           MAJOR USES 14         -0.000 DE-NITROGENATION/SULFURIZATION
           MAJOR USES 15         -0.000 ,SATURATION AROMATIC COMPOUNDS
           VOLATILITY 16          0.000
     PARTICLE DENSITY 17          0.000
       MAX. OP. TEMP. 18          0.000
            ATTRITION 19          0.000
             COMMENTS 20         -0.000 MILDLY ACIDIC

MATERIAL CODE HS214                                              MATERIAL CODE HS214

        CLASSIFICATION  1        -0.000 CAT, PALLADIUM ON ALUMINA
           COMPOSITION  2        -0.000 PD 0.3%, BAL. ACTIVATED AL2O3
     COST, 2CD ACTIVE   3         0.000 NONE
       AVAILABLE SIZES  4        -0.000 1/8X1/8 INCH
      AVAILABLE SHAPES  5        -0.000 TABLETS
        CRUSH STRENGTH  6        24.000
              HARDNESS  7         0.000
             PORE SIZE  8         0.000
           PORE VOLUME  9          .380
         SURFACE AREA 10        186.000
         BULK DENSITY 11         55.000
        CRYSTALLINITY 12          0.000
     CRYSTALLITE SIZE 13          0.000
           MAJOR USES 14         -0.000 HYDROGENATION CATALYST
           MAJOR USES 15          0.000
           VOLATILITY 16          0.000
     PARTICLE DENSITY 17          0.000
       MAX. OP. TEMP. 18          0.000
            ATTRITION 19          0.000
             COMMENTS 20          0.000
```

```
MATERIAL CODE HS215                                        MATERIAL CODE HS215

        CLASSIFICATION  1        -0.000 CAT, PALLADIUM ON ALUMINA
           COMPOSITION  2        -0.000 PD 0.3%, BAL. ACTIVATED AL203
      COST, 2CD ACTIVE  3         0.000 NONE
       AVAILABLE SIZES  4        -0.000 1/8X1/8 INCH
      AVAILABLE SHAPES  5        -0.000 TABLETS
        CRUSH STRENGTH  6        22.000
              HARDNESS  7         0.000
             PORE SIZE  8         0.000
           PORE VOLUME  9          .400
          SURFACE AREA 10       200.000
          BULK DENSITY 11        55.000
        CRYSTALLINITY 12          0.000
      CRYSTALLITE SIZE 13         0.000
            MAJOR USES 14        -0.000 HYDROGENATION CATALYST
            MAJOR USES 15         0.000
            VOLATILITY 16         0.000
      PARTICLE DENSITY 17         0.000
        MAX. OP. TEMP. 18         0.000
             ATTRITION 19         0.000
              COMMENTS 20        -0.000 PD ACTIVATED + STABILIZED


MATERIAL CODE HS216                                        MATERIAL CODE HS216

        CLASSIFICATION  1        -0.000 CAT, PALLADIUM CATALYST
           COMPOSITION  2        -0.000 PD 0.3,BASE MAT L PROPRIETARY
      COST, 2CD ACTIVE  3         0.000 NONE
       AVAILABLE SIZES  4        -0.000 1/8X1/8 INCH
      AVAILABLE SHAPES  5        -0.000 TABLETS
        CRUSH STRENGTH  6        30.000
              HARDNESS  7         0.000
             PORE SIZE  8         0.000
           PORE VOLUME  9          .400
          SURFACE AREA 10       180.000
          BULK DENSITY 11        70.000
         CRYSTALLINITY 12         0.000
      CRYSTALLITE SIZE 13         0.000
            MAJOR USES 14        -0.000 HYDROGENATION CATALYST(STABLE)
            MAJOR USES 15         0.000
            VOLATILITY 16         0.000
      PARTICLE DENSITY 17         0.000
        MAX. OP. TEMP. 18         0.000
             ATTRITION 19         0.000
              COMMENTS 20         0.000
```

```
MATERIAL CODE HS217                                          MATERIAL CODE HS217

     CLASSIFICATION  1      -0.000 CAT, TITANIA ON ALUMINA
        COMPOSITION  2      -0.000 TIO2 86%, BALANCE AL203
   COST, 2CD ACTIVE  3       0.000 AL203 14%
    AVAILABLE SIZES  4      -0.000 1/8X1/8 INCH
   AVAILABLE SHAPES  5      -0.000 TABLETS (WHITE)
     CRUSH STRENGTH  6      14.000
           HARDNESS  7       0.000
          PORE SIZE  8       0.000
        PORE VOLUME  9        .250
       SURFACE AREA 10      70.000
       BULK DENSITY 11      87.000
      CRYSTALLINITY 12       0.000
   CRYSTALLITE SIZE 13       0.000
         MAJOR USES 14       0.000
         MAJOR USES 15       0.000
         VOLATILITY 16       0.000
   PARTICLE DENSITY 17       0.000
     MAX. OP. TEMP. 18       0.000
          ATTRITION 19       0.000
           COMMENTS 20       0.000


MATERIAL CODE HS218                                          MATERIAL CODE HS218

     CLASSIFICATION  1      -0.000 CAT, VANADIUM OXIDE ON ALUMINA
        COMPOSITION  2      -0.000 V205 10, BAL. ACTIVATED AL203
   COST, 2CD ACTIVE  3       0.000 NONE
    AVAILABLE SIZES  4      -0.000 1/8X1/8 INCH
   AVAILABLE SHAPES  5      -0.000 TABLETS (ORANGE)
     CRUSH STRENGTH  6       9.000
           HARDNESS  7       0.000
          PORE SIZE  8       0.000
        PORE VOLUME  9        .330
       SURFACE AREA 10      78.000
       BULK DENSITY 11      59.000
      CRYSTALLINITY 12       0.000
   CRYSTALLITE SIZE 13       0.000
         MAJOR USES 14      -0.000 OXIDATION
         MAJOR USES 15       0.000
         VOLATILITY 16       0.000
   PARTICLE DENSITY 17       0.000
     MAX. OP. TEMP. 18       0.000
          ATTRITION 19       0.000
           COMMENTS 20       0.000
```

```
MATERIAL CODE HS219                                   MATERIAL CODE HS219

      CLASSIFICATION  1      -0.000 CAT, VANADIUM OXIDE ON ALUMINA
         COMPOSITION  2      -0.000 V205 10, BALANCE AL203
    COST, 2CD ACTIVE  3       0.000 NONE
     AVAILABLE SIZES  4       0.000
    AVAILABLE SHAPES  5      -0.000 SPHERES (ORANGE)
      CRUSH STRENGTH  6      27.000
            HARDNESS  7       0.000
           PORE SIZE  8       0.000
         PORE VOLUME  9        .340
        SURFACE AREA 10     214.000
        BULK DENSITY 11      61.000
      CRYSTALLINITY  12       0.000
   CRYSTALLITE SIZE  13       0.000
         MAJOR USES  14      -0.000 OXIDATION
         MAJOR USES  15       0.000
         VOLATILITY  16       0.000
   PARTICLE DENSITY  17       0.000
     MAX. OP. TEMP.  18       0.000
          ATTRITION  19       0.000
           COMMENTS  20       0.000


MATERIAL CODE HS220                                   MATERIAL CODE HS220

      CLASSIFICATION  1      -0.000 CAT, METAL OXIDES ON ALUMINA
         COMPOSITION  2      -0.000 V205 5, MOO3 5, ON INERT AL203
    COST, 2CD ACTIVE  3       0.000 MOO3 5%
     AVAILABLE SIZES  4      -0.000 3/16 INCH DIAMETER
    AVAILABLE SHAPES  5      -0.000 EXTRUSION
      CRUSH STRENGTH  6       0.000
            HARDNESS  7       0.000
           PORE SIZE  8       0.000
         PORE VOLUME  9       0.000
        SURFACE AREA 10       1.000
        BULK DENSITY 11      82.000
      CRYSTALLINITY  12       0.000
   CRYSTALLITE SIZE  13       0.000
         MAJOR USES  14      -0.000 OXIDATION CATALYST
         MAJOR USES  15       0.000
         VOLATILITY  16       0.000
   PARTICLE DENSITY  17       0.000
     MAX. OP. TEMP.  18       0.000
          ATTRITION  19       0.000
           COMMENTS  20       0.000
```

```
MATERIAL CODE HS221                                          MATERIAL CODE HS221

      CLASSIFICATION  1       -0.000 CAT, METAL OXIDES ON ALUMINA
         COMPOSITION  2       -0.000 V205 6, M003 3, ON INERT AL203
    COST, 2CD ACTIVE  3        0.000 M003 3%
     AVAILABLE SIZES  4       -0.000 3/16 INCH DIAMETER
    AVAILABLE SHAPES  5       -0.000 EXTRUSION
      CRUSH STRENGTH  6        0.000
            HARDNESS  7        0.000
           PORE SIZE  8        0.000
         PORE VOLUME  9        0.000
        SURFACE AREA 10        1.000
        BULK DENSITY 11       83.000
      CRYSTALLINITY 12        0.000
    CRYSTALLITE SIZE 13        0.000
         MAJOR USES 14       -0.000 OXIDATION CATALYST
         MAJOR USES 15        0.000
          VOLATILITY 16        0.000
    PARTICLE DENSITY 17        0.000
      MAX. OP. TEMP. 18        0.000
           ATTRITION 19        0.000
            COMMENTS 20        0.000

MATERIAL CODE HS222                                          MATERIAL CODE HS222

      CLASSIFICATION  1       -0.000 CAT, TUNGSTEN OXIDE ON ALUMINA
         COMPOSITION  2       -0.000 W03 10, BAL. ACTIVATED AL203
    COST, 2CD ACTIVE  3        0.000 NONE
     AVAILABLE SIZES  4       -0.000 1/8X1/8 INCH
    AVAILABLE SHAPES  5       -0.000 TABLETS (YELLOW TO WHITE)
      CRUSH STRENGTH  6       11.000
            HARDNESS  7        0.000
           PORE SIZE  8        0.000
         PORE VOLUME  9         .370
        SURFACE AREA 10       75.000
        BULK DENSITY 11       59.000
       CRYSTALLINITY 12        0.000
    CRYSTALLITE SIZE 13        0.000
          MAJOR USES 14        0.000
          MAJOR USES 15        0.000
          VOLATILITY 16        0.000
    PARTICLE DENSITY 17        0.000
      MAX. OP. TEMP. 18        0.000
           ATTRITION 19        0.000
            COMMENTS 20        0.000
```

```
MATERIAL CODE HS223                                         MATERIAL CODE HS223

          CLASSIFICATION  1        -0.000 CAT, TUNGSTEN OXIDE
             COMPOSITION  2        -0.000 WO3 95% (APPROX.)
         COST, 2CD ACTIVE  3         0.000 NOT GIVEN
         AVAILABLE SIZES  4        -0.000 1/8X1/8 INCH
        AVAILABLE SHAPES  5        -0.000 TABLETS
          CRUSH STRENGTH  6         9.000
                HARDNESS  7         0.000
               PORE SIZE  8         0.000
             PORE VOLUME  9          .190
            SURFACE AREA 10        17.000
            BULK DENSITY 11       108.000
          CRYSTALLINITY 12         0.000
        CRYSTALLITE SIZE 13         0.000
              MAJOR USES 14        -0.000 DEHYDRATION
              MAJOR USES 15         0.000
              VOLATILITY 16         0.000
        PARTICLE DENSITY 17         0.000
          MAX. OP. TEMP. 18         0.000
               ATTRITION 19         0.000
                COMMENTS 20        -0.000 SHOULD BE REDUCED BEFORE USE.


MATERIAL CODE HS224                                         MATERIAL CODE HS224

          CLASSIFICATION  1        -0.000 CAT, TUNGSTEN OXIDE ON ALUMINA
             COMPOSITION  2        -0.000 WO3 10, BAL. ACTIVATED AL2O3
         COST, 2CD ACTIVE  3         0.000 NONE
         AVAILABLE SIZES  4        -0.000 1/8X1/8 INCH
        AVAILABLE SHAPES  5        -0.000 TABLETS (GRAY WHITE)
          CRUSH STRENGTH  6        21.000
                HARDNESS  7         0.000
               PORE SIZE  8         0.000
             PORE VOLUME  9          .360
            SURFACE AREA 10       145.000
            BULK DENSITY 11        63.000
          CRYSTALLINITY 12         0.000
        CRYSTALLITE SIZE 13         0.000
              MAJOR USES 14        -0.000 DEHYDRATION
              MAJOR USES 15         0.000
              VOLATILITY 16         0.000
        PARTICLE DENSITY 17         0.000
          MAX. OP. TEMP. 18         0.000
               ATTRITION 19         0.000
                COMMENTS 20         0.000
```

```
MATERIAL CODE HS225                                         MATERIAL CODE HS225

       CLASSIFICATION  1        -0.000 CAT, CHROMITE
          COMPOSITION  2        -0.000 NOT GIVEN (SEE COMMENTS)
     COST, 2CD ACTIVE  3         0.000 CR203 22%
      AVAILABLE SIZES  4        -0.000 1/4X1/4 INCH
     AVAILABLE SHAPES  5        -0.000 TABLETS
       CRUSH STRENGTH  6         0.000
             HARDNESS  7         0.000
            PORE SIZE  8         0.000
          PORE VOLUME  9         0.000
         SURFACE AREA 10         0.000
         BULK DENSITY 11         0.000
       CRYSTALLINITY 12          0.000
    CRYSTALLITE SIZE 13          0.000
          MAJOR USES 14         -0.000 READY AS SHIPPED FOR METHANOL
          MAJOR USES 15         -0.000 SYNTHESIS.
          VOLATILITY 16          0.000
    PARTICLE DENSITY 17          0.000
      MAX. OP. TEMP. 18          0.000
           ATTRITION 19          0.000
            COMMENTS 20         -0.000 REDUCED FORM OF HS125

MATERIAL CODE HS226                                         MATERIAL CODE HS226

       CLASSIFICATION  1        -0.000 CAT, CHROMITE
          COMPOSITION  2        -0.000 NOT GIVEN (SEE COMMENTS)
     COST, 2CD ACTIVE  3         0.000 CR203
      AVAILABLE SIZES  4        -0.000 3/16,1/4,+3/8 INCH,DIA.,LENGTH
     AVAILABLE SHAPES  5        -0.000 TABLETS
       CRUSH STRENGTH  6         0.000
             HARDNESS  7         0.000
            PORE SIZE  8         0.000
          PORE VOLUME  9         0.000
         SURFACE AREA 10         0.000
         BULK DENSITY 11         0.000
        CRYSTALLINITY 12         0.000
     CRYSTALLITE SIZE 13         0.000
           MAJOR USES 14         0.000
           MAJOR USES 15         0.000
           VOLATILITY 16         0.000
     PARTICLE DENSITY 17         0.000
       MAX. OP. TEMP. 18         0.000
            ATTRITION 19         0.000
             COMMENTS 20        -0.000 SIMILAR TO HS125
```

```
MATERIAL CODE HS227                                   MATERIAL CODE HS227

       CLASSIFICATION  1       -0.000 CAT, CHROMITE
          COMPOSITION  2       -0.000 NOT GIVEN (SEE COMMENTS)
     COST, 2CD ACTIVE  3        0.000 CR203
      AVAILABLE SIZES  4       -0.000 3/16,1/4,+3/8 INCH,DIA.,LENGTH
     AVAILABLE SHAPES  5       -0.000 TABLETS
       CRUSH STRENGTH  6        0.000
             HARDNESS  7        0.000
            PORE SIZE  8        0.000
          PORE VOLUME  9        0.000
         SURFACE AREA 10        0.000
         BULK DENSITY 11        0.000
       CRYSTALLINITY 12        0.000
     CRYSTALLITE SIZE 13        0.000
           MAJOR USES 14        0.000
           MAJOR USES 15        0.000
           VOLATILITY 16        0.000
     PARTICLE DENSITY 17        0.000
      MAX. OP. TEMP. 18        0.000
            ATTRITION 19        0.000
             COMMENTS 20       -0.000 SIMILAR TO HS225

MATERIAL CODE HS228                                   MATERIAL CODE HS228

       CLASSIFICATION  1       -0.000 CAT, ZINC OXIDE
          COMPOSITION  2       -0.000 ZNO 100%.
     COST, 2CD ACTIVE  3        0.000 NONE
      AVAILABLE SIZES  4       -0.000 3/16 INCH DIAMETER
     AVAILABLE SHAPES  5       -0.000 EXTRUSION   (WHITE)
       CRUSH STRENGTH  6       18.000
             HARDNESS  7        0.000
            PORE SIZE  8        0.000
          PORE VOLUME  9         .140
         SURFACE AREA 10        7.000
         BULK DENSITY 11       75.000
       CRYSTALLINITY 12        0.000
     CRYSTALLITE SIZE 13        0.000
           MAJOR USES 14       -0.000 REMOVAL OF SULFUR FROM GAS
           MAJOR USES 15       -0.000 STREAMS.
           VOLATILITY 16        0.000
     PARTICLE DENSITY 17        0.000
      MAX. OP. TEMP. 18        0.000
            ATTRITION 19        0.000
             COMMENTS 20        0.000
```

```
MATERIAL CODE HS229                                        MATERIAL CODE HS229

      CLASSIFICATION  1      -0.000 CAT, METAL OXIDES ON ALUMINA
         COMPOSITION  2      -0.000 ZNO 38,CR203 25,/BALANCE AL203
    COST, 2CD ACTIVE  3       0.000 CR203 25%
     AVAILABLE SIZES  4      -0.000 1/8X1/8 INCH
    AVAILABLE SHAPES  5      -0.000 TABLETS (GREENISH-BLACK)
      CRUSH STRENGTH  6      14.000
            HARDNESS  7       0.000
           PORE SIZE  8       0.000
         PORE VOLUME  9        .180
        SURFACE AREA 10      56.000
        BULK DENSITY 11      97.000
       CRYSTALLINITY 12       0.000
    CRYSTALLITE SIZE 13       0.000
          MAJOR USES 14       0.000
          MAJOR USES 15       0.000
          VOLATILITY 16       0.000
    PARTICLE DENSITY 17       0.000
      MAX. OP. TEMP. 18       0.000
           ATTRITION 19       0.000
            COMMENTS 20       0.000

MATERIAL CODE HS230                                        MATERIAL CODE HS230

      CLASSIFICATION  1      -0.000 CAT, METAL OXIDES ON ALUMINA
         COMPOSITION  2      -0.000 ZNO 10,CR203 10, BAL. AL203
    COST, 2CD ACTIVE  3       0.000 CR203 10%
     AVAILABLE SIZES  4      -0.000 1/8X1/8 INCH
    AVAILABLE SHAPES  5      -0.000 TABLETS (GREY)
      CRUSH STRENGTH  6       7.000
            HARDNESS  7       0.000
           PORE SIZE  8       0.000
         PORE VOLUME  9        .280
        SURFACE AREA 10     141.000
        BULK DENSITY 11      68.000
       CRYSTALLINITY 12       0.000
    CRYSTALLITE SIZE 13       0.000
          MAJOR USES 14       0.000
          MAJOR USES 15       0.000
          VOLATILITY 16       0.000
    PARTICLE DENSITY 17       0.000
      MAX. OP. TEMP. 18       0.000
           ATTRITION 19       0.000
            COMMENTS 20       0.000
```

```
MATERIAL CODE HS231                                          MATERIAL CODE HS231

         CLASSIFICATION  1       -0.000 CAT, ZINC OXIDE ON ALUMINA
           COMPOSITION  2        -0.000 ZNO 24 ,BAL. ACTIVATED AL203
       COST, 2CD ACTIVE  3        0.000 NONE
        AVAILABLE SIZES  4       -0.000 1/8X1/8 INCH
       AVAILABLE SHAPES  5       -0.000 TABLETS (WHITE)
         CRUSH STRENGTH  6        9.000
               HARDNESS  7        0.000
              PORE SIZE  8        0.000
            PORE VOLUME  9         .250
          SURFACE AREA 10        45.000
           BULK DENSITY 11       75.000
          CRYSTALLINITY 12        0.000
       CRYSTALLITE SIZE 13        0.000
             MAJOR USES 14        0.000
             MAJOR USES 15        0.000
             VOLATILITY 16        0.000
       PARTICLE DENSITY 17        0.000
         MAX. OP. TEMP. 18        0.000
              ATTRITION 19        0.000
               COMMENTS 20        0.000

MATERIAL CODE HS232                                          MATERIAL CODE HS232

         CLASSIFICATION  1       -0.000 CAT, ZINC ACETATE
            COMPOSITION  2       -0.000 ZN(C2H302)2 10%, BAL. CARBON
       COST, 2CD ACTIVE  3        0.000 NONE
        AVAILABLE SIZES  4       -0.000 4-10 MESH
       AVAILABLE SHAPES  5       -0.000 GRANULES
         CRUSH STRENGTH  6        0.000
               HARDNESS  7        0.000
              PORE SIZE  8        0.000
            PORE VOLUME  9        0.000
           SURFACE AREA 10        0.000
           BULK DENSITY 11       45.000
          CRYSTALLINITY 12        0.000
       CRYSTALLITE SIZE 13        0.000
             MAJOR USES 14       -0.000 CONVERT ACETYLENE AND ACETIC
             MAJOR USES 15       -0.000 ACID TO VINYL ACETATE MONOMER
             VOLATILITY 16        0.000
       PARTICLE DENSITY 17        0.000
         MAX. OP. TEMP. 18        0.000
              ATTRITION 19        0.000
               COMMENTS 20        0.000
```

```
MATERIAL CODE HS233                                    MATERIAL CODE HS233

      CLASSIFICATION  1      -0.000 CAT, ZIRCONIA
         COMPOSITION  2      -0.000 ZRO2 98%, BALANCE AL2O3
    COST, 2CD ACTIVE  3       0.000 AL2O3 2%
     AVAILABLE SIZES  4      -0.000 1/8X1/8 INCH
    AVAILABLE SHAPES  5      -0.000 TABLETS (WHITE)
      CRUSH STRENGTH  6      24.000
            HARDNESS  7       0.000
           PORE SIZE  8       0.000
         PORE VOLUME  9        .210
       SURFACE AREA  10      50.000
       BULK DENSITY  11     116.000
     CRYSTALLINITY  12       0.000
   CRYSTALLITE SIZE  13       0.000
         MAJOR USES  14       0.000
         MAJOR USES  15       0.000
         VOLATILITY  16       0.000
   PARTICLE DENSITY  17       0.000
     MAX. OP. TEMP.  18       0.000
          ATTRITION  19       0.000
           COMMENTS  20       0.000

MATERIAL CODE HS234                                    MATERIAL CODE HS234

      CLASSIFICATION  1      -0.000 CAT, ALUMINA
         COMPOSITION  2      -0.000 AL2O3 91%, SIO2 6%
    COST, 2CD ACTIVE  3       0.000 SIO2 6%
     AVAILABLE SIZES  4      -0.000 1/8X1/8 INCH
    AVAILABLE SHAPES  5      -0.000 TABLETS
      CRUSH STRENGTH  6      25.000
            HARDNESS  7       0.000
           PORE SIZE  8       0.000
         PORE VOLUME  9        .480
       SURFACE AREA  10     240.000
       BULK DENSITY  11      52.000
     CRYSTALLINITY  12       0.000
   CRYSTALLITE SIZE  13       0.000
         MAJOR USES  14      -0.000 CATALYST SUPPORT
         MAJOR USES  15       0.000
         VOLATILITY  16       0.000
   PARTICLE DENSITY  17       0.000
     MAX. OP. TEMP.  18       0.000
          ATTRITION  19       0.000
           COMMENTS  20       0.000
```

```
MATERIAL CODE KC101                                          MATERIAL CODE KC101

       CLASSIFICATION  1        -0.000 CRR, ACTIVATED ALUMINA
          COMPOSITION  2         0.000 AL2O3 93.6%, NA2O 0.30%
     COST, 2CD ACTIVE  3       320.000 NA2O .3%
      AVAILABLE SIZES  4         0.000 1/4X8 MESH, 1/4X1/2 INCH
     AVAILABLE SHAPES  5         0.000 BALLS
       CRUSH STRENGTH  6        50.000
             HARDNESS  7         0.000
            PORE SIZE  8        50.000
          PORE VOLUME  9          .510
         SURFACE AREA 10       380.000
         BULK DENSITY 11        47.000
        CRYSTALLINITY 12         0.000
     CRYSTALLITE SIZE 13         0.000
           MAJOR USES 14         0.000
           MAJOR USES 15         0.000
           VOLATILITY 16         6.000
     PARTICLE DENSITY 17         0.000
       MAX. OP. TEMP. 18         0.000
            ATTRITION 19          .200
             COMMENTS 20         0.000


MATERIAL CODE MB101                                          MATERIAL CODE MB101

       CLASSIFICATION  1        -0.000 CAT, PLATINUM ON TORVEX
          COMPOSITION  2        -0.000 NOT GIVEN
     COST, 2CD ACTIVE  3    111000.000 NONE
      AVAILABLE SIZES  4         0.000
     AVAILABLE SHAPES  5         0.000
       CRUSH STRENGTH  6         0.000
             HARDNESS  7         0.000
            PORE SIZE  8         0.000
          PORE VOLUME  9         0.000
         SURFACE AREA 10         0.000
         BULK DENSITY 11         0.000
        CRYSTALLINITY 12         0.000
     CRYSTALLITE SIZE 13         0.000
           MAJOR USES 14        -0.000 NOX, HYDROCARBON FUME REMOVAL
           MAJOR USES 15         0.000
           VOLATILITY 16         0.000
     PARTICLE DENSITY 17         0.000
       MAX. OP. TEMP. 18         0.000
            ATTRITION 19         0.000
             COMMENTS 20        -0.000 SEE DP101 AND DP102 FOR TORVEX
```

```
MATERIAL CODE MN101                                          MATERIAL CODE MN101

        CLASSIFICATION  1        -0.000 CAT, VANADIUM OXIDE
           COMPOSITION  2        -0.000 V205,CARRIER NOT SPECIFIED
      COST, 2CD ACTIVE  3      2080.000 NONE
       AVAILABLE SIZES  4        -0.000 0.2 IN.DIA. X 0.3 IN. LENGTH
      AVAILABLE SHAPES  5        -0.000 EXTRUDED PELLETS
        CRUSH STRENGTH  6         0.000
              HARDNESS  7         0.000
             PORE SIZE  8         0.000
           PORE VOLUME  9         0.000
          SURFACE AREA 10         0.000
          BULK DENSITY 11        34.000 MIN, 51 MAX.
        CRYSTALLINITY  12         0.000
      CRYSTALLITE SIZE 13         0.000
            MAJOR USES 14        -0.000 H2SO4 CONTACT CATALYST
            MAJOR USES 15         0.000
            VOLATILITY 16         0.000
      PARTICLE DENSITY 17         0.000
        MAX. OP. TEMP. 18         0.000
             ATTRITION 19        -0.000 HIGHLY RESISTANT TO DISINTEGR.
              COMMENTS 20        -0.000 IMMUNE TO COMMON POISONS

MATERIAL CODE MN102                                          MATERIAL CODE MN102

        CLASSIFICATION  1        -0.000 CAT, VANADIUM OXIDE
           COMPOSITION  2        -0.000 V205,CARRIER NOT SPECIFIED
      COST, 2CD ACTIVE  3      2160.000 NONE
       AVAILABLE SIZES  4        -0.000 0.2 IN.DIA. X 0.3 IN. LENGTH
      AVAILABLE SHAPES  5        -0.000 EXTRUDED PELLETS
        CRUSH STRENGTH  6         0.000
              HARDNESS  7         0.000
             PORE SIZE  8         0.000
           PORE VOLUME  9         0.000
          SURFACE AREA 10         0.000
          BULK DENSITY 11        34.000 MIN, 51 MAX.
        CRYSTALLINITY  12         0.000
      CRYSTALLITE SIZE 13         0.000
            MAJOR USES 14        -0.000 H2SO4 CONTACT CATALYST
            MAJOR USES 15         0.000
            VOLATILITY 16         0.000
      PARTICLE DENSITY 17         0.000
        MAX. OP. TEMP. 18         0.000
             ATTRITION 19        -0.000 RESISTANT
              COMMENTS 20        -0.000 FOR HIGH SO3 CONCENTRATIONS
```

```
MATERIAL CODE MN103                                      MATERIAL CODE MN103

       CLASSIFICATION  1        -0.000 CAT, VANADIUM OXIDE
          COMPOSITION  2        -0.000 V205,CARRIER NOT SPECIFIED
     COST, 2CD ACTIVE  3         0.000 NONE
      AVAILABLE SIZES  4        -0.000 2.8 IN.DIA. X 0.14 IN. THICK
     AVAILABLE SHAPES  5        -0.000 TABLETS
       CRUSH STRENGTH  6         0.000
             HARDNESS  7         0.000
            PORE SIZE  8         0.000
          PORE VOLUME  9         0.000
         SURFACE AREA 10         0.000
         BULK DENSITY 11         0.000
       CRYSTALLINITY 12          0.000
    CRYSTALLITE SIZE 13          0.000
          MAJOR USES 14         -0.000 H2SO4 CONTACT CATALYST
          MAJOR USES 15          0.000
          VOLATILITY 16          0.000
    PARTICLE DENSITY 17          0.000
      MAX. OP. TEMP. 18          0.000
           ATTRITION 19          1.000 LOW ATTRITION LOSS
            COMMENTS 20         -0.000 RUGGED IN FIXED-BED OPERATION


MATERIAL CODE NC101                                      MATERIAL CODE NC101

       CLASSIFICATION  1        -0.000 CRR, ZEOLITE, SYNTHETIC
          COMPOSITION  2        -0.000 NOT GIVEN
     COST, 2CD ACTIVE  3      6500.000 NOT GIVEN
      AVAILABLE SIZES  4         0.000 1/8 1/16 PELLETS,5 MICRON POWD
     AVAILABLE SHAPES  5         0.000 PELLET, POWDER
       CRUSH STRENGTH  6        26.000
             HARDNESS  7         0.000
            PORE SIZE  8         9.000
          PORE VOLUME  9         0.000
         SURFACE AREA 10       450.000 PELLET
         BULK DENSITY 11        32.000 PELLET
        CRYSTALLINITY 12         0.000
     CRYSTALLITE SIZE 13         0.000
           MAJOR USES 14         0.000 ALKYLATION AND ISOMERIZATION
           MAJOR USES 15         0.000 DRY REFORMER RECYCLE HYDROGEN
           VOLATILITY 16         0.000
     PARTICLE DENSITY 17         0.000
       MAX. OP. TEMP. 18      1500.000 MAXIMUM
            ATTRITION 19         0.000
             COMMENTS 20         0.000
```

```
MATERIAL CODE NL101                                          MATERIAL CODE NL101

       CLASSIFICATION  1      -0.000 CAT, SYNTHETIC SIO2-AL203 TYPE
          COMPOSITION  2      -0.000 AL203 13, SO4 0.4, BAL. SIO2
     COST, 2CD ACTIVE  3     315.000 AL203 13%
      AVAILABLE SIZES  4       0.000
     AVAILABLE SHAPES  5       0.000
       CRUSH STRENGTH  6       0.000
             HARDNESS  7       0.000
            PORE SIZE  8      70.000
          PORE VOLUME  9        .800 MIN. 0.85 MAX.
         SURFACE AREA 10     520.000
         BULK DENSITY 11      26.000
        CRYSTALLINITY 12       0.000
     CRYSTALLITE SIZE 13       0.000
          MAJOR USES 14      -0.000 FLUID CRACKING
          MAJOR USES 15       0.000
          VOLATILITY 16      13.000
    PARTICLE DENSITY 17       0.000
      MAX. OP. TEMP. 18       0.000
           ATTRITION 19       0.000
            COMMENTS 20       0.000


MATERIAL CODE NL102                                          MATERIAL CODE NL102

       CLASSIFICATION  1      -0.000 CAT, SYNTHETIC SIO2-AL203 TYPE
          COMPOSITION  2      -0.000 AL203 25, SO4 0.4, BAL. SIO2
     COST, 2CD ACTIVE  3     355.000 AL203 25%
      AVAILABLE SIZES  4       0.000
     AVAILABLE SHAPES  5       0.000
       CRUSH STRENGTH  6       0.000
             HARDNESS  7       0.000
            PORE SIZE  8      80.000
          PORE VOLUME  9        .800 MIN. 0.9 MAX.
         SURFACE AREA 10     440.000
         BULK DENSITY 11      26.000
        CRYSTALLINITY 12       0.000
     CRYSTALLITE SIZE 13       0.000
          MAJOR USES 14      -0.000 FLUID CRACKING
          MAJOR USES 15       0.000
          VOLATILITY 16      13.000
    PARTICLE DENSITY 17       0.000
      MAX. OP. TEMP. 18       0.000
           ATTRITION 19       0.000
            COMMENTS 20       0.000
```

```
MATERIAL CODE NL103                                          MATERIAL CODE NL103

     CLASSIFICATION  1        -0.000 CAT, MODIFIED SYNTHETIC TYPE
        COMPOSITION  2        -0.000 AL203 33, SO4 0.4, BAL. SIO2
   COST, 2CD ACTIVE  3       240.000 AL203 33%
    AVAILABLE SIZES  4         0.000
   AVAILABLE SHAPES  5         0.000
     CRUSH STRENGTH  6         0.000
           HARDNESS  7         0.000
          PORE SIZE  8        95.000
        PORE VOLUME  9          .650
       SURFACE AREA 10       280.000
       BULK DENSITY 11        31.000
     CRYSTALLINITY 12          0.000
  CRYSTALLITE SIZE 13          0.000
         MAJOR USES 14        -0.000 FLUID CRACKING
         MAJOR USES 15         0.000
         VOLATILITY 16        13.000
   PARTICLE DENSITY 17         0.000
     MAX. OP. TEMP. 18         0.000
          ATTRITION 19         0.000
           COMMENTS 20         0.000

MATERIAL CODE NL104                                          MATERIAL CODE NL104

     CLASSIFICATION  1        -0.000 CAT, MODIFIED SYNTHETIC TYPE
        COMPOSITION  2        -0.000 AL203 29, SO4 0.4, BAL. SIO2
   COST, 2CD ACTIVE  3       297.500 AL203 29%
    AVAILABLE SIZES  4         0.000
   AVAILABLE SHAPES  5         0.000
     CRUSH STRENGTH  6         0.000
           HARDNESS  7         0.000
          PORE SIZE  8        95.000
        PORE VOLUME  9          .650
       SURFACE AREA 10       350.000
       BULK DENSITY 11        31.000
     CRYSTALLINITY 12          0.000
  CRYSTALLITE SIZE 13          0.000
         MAJOR USES 14        -0.000 FLUID CRACKING
         MAJOR USES 15         0.000
         VOLATILITY 16        13.000
   PARTICLE DENSITY 17         0.000
     MAX. OP. TEMP. 18         0.000
          ATTRITION 19         0.000
           COMMENTS 20         0.000
```

```
MATERIAL CODE NL105                                          MATERIAL CODE NL105

      CLASSIFICATION  1       -0.000 CAT, MOLECULAR SIEVE TYPE
         COMPOSITION  2       -0.000 AL203 32, S04 0.4, BAL. SI02
    COST, 2CD ACTIVE  3      425.000 AL203 32%
     AVAILABLE SIZES  4        0.000
    AVAILABLE SHAPES  5        0.000
      CRUSH STRENGTH  6        0.000
            HARDNESS  7        0.000
           PORE SIZE  8       82.000
         PORE VOLUME  9         .550 MIN., 0.60 MAX.
        SURFACE AREA 10      280.000
        BULK DENSITY 11       33.000
      CRYSTALLINITY  12        0.000
   CRYSTALLITE SIZE  13        0.000
          MAJOR USES 14       -0.000 FLUID CRACKING
          MAJOR USES 15        0.000
          VOLATILITY 16       13.000
    PARTICLE DENSITY 17        0.000
     MAX. OP. TEMP.  18        0.000
           ATTRITION 19        0.000
            COMMENTS 20        0.000

MATERIAL CODE NL106                                          MATERIAL CODE NL106

      CLASSIFICATION  1       -0.000 CAT, MOLECULAR SIEVE TYPE
         COMPOSITION  2       -0.000 AL203 32, S04 0.4, BAL. SI02
    COST, 2CD ACTIVE  3      471.000 AL203 32%
     AVAILABLE SIZES  4        0.000
    AVAILABLE SHAPES  5        0.000
      CRUSH STRENGTH  6        0.000
            HARDNESS  7        0.000
           PORE SIZE  8       90.000
         PORE VOLUME  9         .600 MIN, 0.65 MAX.
        SURFACE AREA 10      270.000
        BULK DENSITY 11       33.000
      CRYSTALLINITY  12        0.000
   CRYSTALLITE SIZE  13        0.000
          MAJOR USES 14       -0.000 FLUID CRACKING
          MAJOR USES 15        0.000
          VOLATILITY 16       13.000
    PARTICLE DENSITY 17        0.000
     MAX. OP. TEMP.  18        0.000
           ATTRITION 19        0.000
            COMMENTS 20        0.000
```

```
MATERIAL CODE NL107                                        MATERIAL CODE NL107

       CLASSIFICATION  1      -0.000 CAT, MO, CO, OXIDES ON ALUMINA
          COMPOSITION  2      -0.000 MOO3 12.5, COO 3.5
     COST, 2CD ACTIVE  3    1680.000 COO 3.5%
      AVAILABLE SIZES  4      -0.000 1/16, 1/8 INCH
     AVAILABLE SHAPES  5      -0.000 EXTRUSION
       CRUSH STRENGTH  6      14.000
             HARDNESS  7       0.000
            PORE SIZE  8       0.000
          PORE VOLUME  9        .460
         SURFACE AREA 10     260.000
         BULK DENSITY 11      39.000
       CRYSTALLINITY 12        0.000
     CRYSTALLITE SIZE 13       0.000
           MAJOR USES 14      -0.000 HYDODESULFURIZATION
           MAJOR USES 15       0.000
           VOLATILITY 16       0.000
     PARTICLE DENSITY 17       0.000
      MAX. OP. TEMP. 18        0.000
            ATTRITION 19      92.000 AFTER TUMBLING FOR ONE HOUR
             COMMENTS 20       0.000

MATERIAL CODE NL108                                        MATERIAL CODE NL108

       CLASSIFICATION  1      -0.000 CAT, MO, CO, OXIDES ON ALUMINA
          COMPOSITION  2      -0.000 MOO3 12.5, COO 3.5
     COST, 2CD ACTIVE  3    1800.000 COO 3.5%
      AVAILABLE SIZES  4      -0.000 1/16, 1/8 INCH
     AVAILABLE SHAPES  5      -0.000 EXTRUSION
       CRUSH STRENGTH  6      13.000
             HARDNESS  7       0.000
            PORE SIZE  8      75.000
          PORE VOLUME  9        .510
         SURFACE AREA 10     270.000
         BULK DENSITY 11      45.000
        CRYSTALLINITY 12       0.000
     CRYSTALLITE SIZE 13       0.000
           MAJOR USES 14      -0.000 HYDRODESULFURIZATION
           MAJOR USES 15       0.000
           VOLATILITY 16       0.000
     PARTICLE DENSITY 17       0.000
       MAX. OP. TEMP. 18       0.000
            ATTRITION 19      91.000 AFTER TUMBLING FOR ONE HOUR
             COMMENTS 20       0.000
```

```
MATERIAL CODE NL109                                                MATERIAL CODE NL109

     CLASSIFICATION  1         -0.000 CAT, NI ON SIO2-AL2O3
        COMPOSITION  2         -0.000 MOO3 13, NI 4.5, SIO2 15
   COST, 2CD ACTIVE  3       1900.000 NI 4.5%
    AVAILABLE SIZES  4         -0.000 1/16, 1/8 INCH
   AVAILABLE SHAPES  5         -0.000 EXTRUSION
     CRUSH STRENGTH  6         12.000
           HARDNESS  7          0.000
          PORE SIZE  8          0.000
        PORE VOLUME  9           .500
       SURFACE AREA 10        360.000
       BULK DENSITY 11         35.000
      CRYSTALLINITY 12          0.000
   CRYSTALLITE SIZE 13          0.000
         MAJOR USES 14         -0.000 DESULFURIZATION
         MAJOR USES 15          0.000
         VOLATILITY 16          0.000
   PARTICLE DENSITY 17          0.000
     MAX. OP. TEMP. 18          0.000
          ATTRITION 19         92.000 AFTER TUMBLING FOR ONE HOUR
           COMMENTS 20          0.000


MATERIAL CODE NL110                                                MATERIAL CODE NL110

     CLASSIFICATION  1         -0.000 CAT, MO, NI ON ALUMINA
        COMPOSITION  2         -0.000 MOO3 14, NIO 2.8, SIO2 1.5
   COST, 2CD ACTIVE  3       2040.000 NIO 2.8%
    AVAILABLE SIZES  4         -0.000 1/16, 1/8 INCH
   AVAILABLE SHAPES  5         -0.000 EXTRUSION
     CRUSH STRENGTH  6         13.000
           HARDNESS  7          0.000
          PORE SIZE  8         75.000
        PORE VOLUME  9           .510
       SURFACE AREA 10        270.000
       BULK DENSITY 11         45.000
      CRYSTALLINITY 12          0.000
   CRYSTALLITE SIZE 13          0.000
         MAJOR USES 14         -0.000 DESULFURIZATION
         MAJOR USES 15          0.000
         VOLATILITY 16          0.000
   PARTICLE DENSITY 17          0.000
     MAX. OP. TEMP. 18          0.000
          ATTRITION 19         91.000 AFTER TUMBLING FOR ONE HOUR
           COMMENTS 20          0.000
```

```
MATERIAL CODE NL111                                       MATERIAL CODE NL111

          CLASSIFICATION  1      -0.000 CAT, NICKEL-TUNGSTEN
             COMPOSITION  2      -0.000 W 16, NI 4, SO4 0.4 BAL. AL203
        COST, 2CD ACTIVE  3    3240.000 NI 4%
         AVAILABLE SIZES  4       0.000
        AVAILABLE SHAPES  5       0.000
          CRUSH STRENGTH  6      14.000
                HARDNESS  7       0.000
               PORE SIZE  8       0.000
             PORE VOLUME  9        .380
            SURFACE AREA 10     215.000
            BULK DENSITY 11      50.000
          CRYSTALLINITY  12       0.000
        CRYSTALLITE SIZE 13       0.000
              MAJOR USES 14      -0.000 SPECIFIC HYDROTREATING
              MAJOR USES 15       0.000
              VOLATILITY 16       2.500 AT 1200F
        PARTICLE DENSITY 17       0.000
          MAX. OP. TEMP. 18       0.000
               ATTRITION 19      91.000 AFTER TUMBLING FOR ONE HOUR
                COMMENTS 20       0.000

MATERIAL CODE NL112                                       MATERIAL CODE NL112

          CLASSIFICATION  1      -0.000 CRR, ALUMINA BASE
             COMPOSITION  2      -0.000 ALUMINA
        COST, 2CD ACTIVE  3       0.000 NONE
         AVAILABLE SIZES  4      -0.000 EXTRUDED OR MICROSPHEROIDAL
        AVAILABLE SHAPES  5       0.000
          CRUSH STRENGTH  6       0.000
                HARDNESS  7       0.000
               PORE SIZE  8       0.000
             PORE VOLUME  9       0.000
            SURFACE AREA 10       0.000
            BULK DENSITY 11       0.000
           CRYSTALLINITY 12       0.000
        CRYSTALLITE SIZE 13       0.000
              MAJOR USES 14       0.000
              MAJOR USES 15       0.000
              VOLATILITY 16       0.000
        PARTICLE DENSITY 17       0.000
          MAX. OP. TEMP. 18       0.000
               ATTRITION 19       0.000
                COMMENTS 20       0.000
```

```
MATERIAL CODE NL113                                    MATERIAL CODE NL113

       CLASSIFICATION  1        -0.000 CAT, SILICA-ALUMINA
          COMPOSITION  2        -0.000 AL203 33, NA20 .09, SI02-BAL.
     COST, 2CD ACTIVE  3       650.000 NA20 .09
      AVAILABLE SIZES  4         0.000
     AVAILABLE SHAPES  5         0.000
       CRUSH STRENGTH  6         0.000
             HARDNESS  7         0.000
            PORE SIZE  8         0.000
          PORE VOLUME  9          .630
         SURFACE AREA 10       300.000
         BULK DENSITY 11        32.000
        CRYSTALLINITY 12         0.000
     CRYSTALLITE SIZE 13         0.000
           MAJOR USES 14        -0.000 FLUID CRACKING
           MAJOR USES 15         0.000
           VOLATILITY 16         0.000
     PARTICLE DENSITY 17         0.000
       MAX. OP. TEMP. 18         0.000
            ATTRITION 19         0.000
             COMMENTS 20         0.000


MATERIAL CODE RM101                                    MATERIAL CODE RM101

       CLASSIFICATION  1        -0.000 CRR, ALUMINA
          COMPOSITION  2        -0.000 AL203 92.2,NA20 .5,SI02 .10
     COST, 2CD ACTIVE  3       260.000 NA20 .5
      AVAILABLE SIZES  4         0.000 1/2-1/4, 1/4-8 MESH,8-14 MESH
     AVAILABLE SHAPES  5         0.000 IRREGULAR GRANULES
       CRUSH STRENGTH  6         0.000
             HARDNESS  7         0.000
            PORE SIZE  8         0.000
          PORE VOLUME  9          .200 MIN, 0.25 MAX
         SURFACE AREA 10       210.000 MIN, 240. MAX
         BULK DENSITY 11        50.000 MIN, 55. MAX
        CRYSTALLINITY 12         0.000
     CRYSTALLITE SIZE 13         0.000
           MAJOR USES 14         0.000
           MAJOR USES 15         0.000
           VOLATILITY 16         0.000
     PARTICLE DENSITY 17         0.000
       MAX. OP. TEMP. 18         0.000
            ATTRITION 19         0.000
             COMMENTS 20         0.000
```

```
MATERIAL CODE UA101                                      MATERIAL CODE UA101

         CLASSIFICATION  1      -0.000 CAT, POROUS CERAMIC
            COMPOSITION  2      -0.000 NOT GIVEN
      COST, 2CD ACTIVE   3   24000.000 NOT GIVEN
        AVAILABLE SIZES  4       0.000
       AVAILABLE SHAPES  5       0.000
         CRUSH STRENGTH  6       0.000
               HARDNESS  7       0.000
              PORE SIZE  8       0.000
            PORE VOLUME  9       0.000
           SURFACE AREA 10       0.000
           BULK DENSITY 11       0.000
         CRYSTALLINITY  12       0.000
       CRYSTALLITE SIZE 13       0.000
             MAJOR USES 14      -0.000 OXIDATION OF SO2, HYDROCARBONS
             MAJOR USES 15      -0.000 AT LOW TEMPERATURE
             VOLATILITY 16       0.000
       PARTICLE DENSITY 17       0.000
         MAX. OP. TEMP. 18       0.000
              ATTRITION 19       0.000
               COMMENTS 20      -0.000 MFGR CAN SUPPLY MORE INFO.


MATERIAL CODE UA102                                      MATERIAL CODE UA102

         CLASSIFICATION  1      -0.000 CAT, POROUS CERAMIC
            COMPOSITION  2      -0.000 NOT GIVEN
      COST, 2CD ACTIVE   3   58000.000 NOT GIVEN
        AVAILABLE SIZES  4       0.000
       AVAILABLE SHAPES  5       0.000
         CRUSH STRENGTH  6       0.000
               HARDNESS  7       0.000
              PORE SIZE  8       0.000
            PORE VOLUME  9       0.000
           SURFACE AREA 10       0.000
           BULK DENSITY 11       0.000
         CRYSTALLINITY  12       0.000
       CRYSTALLITE SIZE 13       0.000
             MAJOR USES 14      -0.000 OXIDATION OF HYDROGEN (LOW T)
             MAJOR USES 15       0.000
             VOLATILITY 16       0.000
       PARTICLE DENSITY 17       0.000
         MAX. OP. TEMP. 18       0.000
              ATTRITION 19       0.000
               COMMENTS 20      -0.000 MFGR CAN SUPPLY MORE INFO.
```

```
MATERIAL CODE UA103                                           MATERIAL CODE UA103

       CLASSIFICATION  1        -0.000 CAT, METAL ON METAL
          COMPOSITION  2        -0.000 NI 60%, CR 20%, FE 20%
     COST, 2CD ACTIVE  3     85000.000 CR 20%, FE 20%
      AVAILABLE SIZES  4         0.000
     AVAILABLE SHAPES  5         0.000
       CRUSH STRENGTH  6         0.000
             HARDNESS  7         0.000
            PORE SIZE  8         0.000
          PORE VOLUME  9         0.000
         SURFACE AREA 10         0.000
         BULK DENSITY 11         0.000
       CRYSTALLINITY 12         0.000
     CRYSTALLITE SIZE 13         0.000
           MAJOR USES 14        -0.000 COMBUSTION HYDROCARRON FUMES
           MAJOR USES 15         0.000
           VOLATILITY 16         0.000
     PARTICLE DENSITY 17         0.000
      MAX. OP. TEMP. 18      1450.000
            ATTRITION 19         0.000
             COMMENTS 20        -0.000 OK IN REDUCING ATMOSPHERES


MATERIAL CODE UC101                                           MATERIAL CODE UC101

       CLASSIFICATION  1        -0.000 SOR, MOLECULAR SIEVE
          COMPOSITION  2        -0.000 NOT GIVEN
     COST, 2CD ACTIVE  3      2670.000 NOT GIVEN
      AVAILABLE SIZES  4        -0.000 1/8, 1/16 INCH
     AVAILABLE SHAPES  5        -0.000 PELLETS
       CRUSH STRENGTH  6         0.000
             HARDNESS  7         0.000
            PORE SIZE  8         4.000
          PORE VOLUME  9         0.000
         SURFACE AREA 10         0.000
         BULK DENSITY 11        55.400
       CRYSTALLINITY 12         0.000
     CRYSTALLITE SIZE 13         0.000
           MAJOR USES 14        -0.000 REMOVES SO2 AND OXIDES OF N2
           MAJOR USES 15        -0.000 FROM PROCESS STREAMS
           VOLATILITY 16         0.000
     PARTICLE DENSITY 17         0.000
      MAX. OP. TEMP. 18         0.000
            ATTRITION 19         0.000
             COMMENTS 20         0.000
```

```
MATERIAL CODE UC102                                    MATERIAL CODE UC102

       CLASSIFICATION  1        -0.000 SOR, MOLECULAR SIEVE
          COMPOSITION  2        -0.000 NOT GIVEN
     COST, 2CD ACTIVE  3      2000.000 NOT GIVEN
      AVAILABLE SIZES  4         0.000
     AVAILABLE SHAPES  5         0.000
       CRUSH STRENGTH  6         0.000
             HARDNESS  7         0.000
            PORE SIZE  8         5.000
          PORE VOLUME  9         0.000
         SURFACE AREA 10         0.000
         BULK DENSITY 11        45.400
        CRYSTALLINITY 12         0.000
     CRYSTALLITE SIZE 13         0.000
           MAJOR USES 14        -0.000 REMOVES SO2 AND OXIDES OF N2
           MAJOR USES 15        -0.000 FROM STREAMS; DRIES SOUR GAS
           VOLATILITY 16         0.000
     PARTICLE DENSITY 17         0.000
       MAX. OP. TEMP. 18         0.000
            ATTRITION 19         0.000
             COMMENTS 20         0.000


MATERIAL CODE UC201                                    MATERIAL CODE UC201

       CLASSIFICATION  1        -0.000 SOR, MOLECULAR SIEVE
          COMPOSITION  2        -0.000 NOT GIVEN
     COST, 2CD ACTIVE  3      2670.000 NOT GIVEN
      AVAILABLE SIZES  4        -0.000 1/16, 1/8 INCH
     AVAILABLE SHAPES  5        -0.000 POWDER, PELLETS
       CRUSH STRENGTH  6        12.600 1/8  INCH PELLETS
             HARDNESS  7         0.000
            PORE SIZE  8         5.000
          PORE VOLUME  9         0.000
         SURFACE AREA 10         0.000
         BULK DENSITY 11        45.000
        CRYSTALLINITY 12        -0.000 POWDER FORM-CUBIC
     CRYSTALLITE SIZE 13         0.000
           MAJOR USES 14        -0.000 SEPARATES NORMAL FROM BRANCHED
           MAJOR USES 15        -0.000 PARAFFINS
           VOLATILITY 16         0.000
     PARTICLE DENSITY 17         0.000
       MAX. OP. TEMP. 18         0.000
            ATTRITION 19         0.000
             COMMENTS 20         0.000
```

```
MATERIAL CODE UC202                                      MATERIAL CODE UC202


      CLASSIFICATION  1       -0.000 SOR, MOLECULAR SIEVE
         COMPOSITION  2       -0.000 NOT GIVEN
    COST, 2CD ACTIVE  3     3260.000 NOT GIVEN
     AVAILABLE SIZES  4       -0.000 1/16, 1/8 INCH
    AVAILABLE SHAPES  5       -0.000 POWDER, PELLETS
      CRUSH STRENGTH  6       24.000 1/8 INCH PELLETS
            HARDNESS  7        0.000
           PORE SIZE  8       10.000
         PORE VOLUME  9        0.000
        SURFACE AREA 10        0.000
        BULK DENSITY 11       42.000 1/16 AND 1/8 INCH PELLETS
      CRYSTALLINITY 12       -0.000 POWDER FORM-OCTAHEDRAL
   CRYSTALLITE SIZE 13        0.000
         MAJOR USES 14       -0.000 REMOVES H20, CO2, H2S FROM GAS
         MAJOR USES 15        0.000
         VOLATILITY 16        0.000
   PARTICLE DENSITY 17        0.000
     MAX. OP. TEMP. 18        0.000
          ATTRITION 19        0.000
           COMMENTS 20        0.000


MATERIAL CODE UC203                                      MATERIAL CODE UC203


      CLASSIFICATION  1       -0.000 SOR, MOLECULAR SIEVE
         COMPOSITION  2       -0.000 NOT GIVEN
    COST, 2CD ACTIVE  3     2720.000 NOT GIVEN
     AVAILABLE SIZES  4       -0.000 1/16, 1/8 INCH
    AVAILABLE SHAPES  5       -0.000 PELLETS, POWDER
      CRUSH STRENGTH  6       14.500 1/8 INCH PELLETS
            HARDNESS  7        0.000
           PORE SIZE  8        3.000
         PORE VOLUME  9        0.000
        SURFACE AREA 10        0.000
        BULK DENSITY 11       47.000 1/8 INCH PELLETS
      CRYSTALLINITY 12       -0.000 POWDER FORM-CUBIC
   CRYSTALLITE SIZE 13        0.000
         MAJOR USES 14       -0.000 DEHYDRATION
         MAJOR USES 15        0.000
         VOLATILITY 16        0.000
   PARTICLE DENSITY 17        0.000
     MAX. OP. TEMP. 18        0.000
          ATTRITION 19        0.000
           COMMENTS 20        0.000
```

```
MATERIAL CODE UC204                                   MATERIAL CODE UC204

       CLASSIFICATION  1        -0.000 SOR, MOLECULAR SIEVE
          COMPOSITION  2        -0.000 NOT GIVEN
     COST, 2CD ACTIVE  3      2460.000 NOT GIVEN
      AVAILABLE SIZES  4        -0.000 1/16, 1/8 INCH, 14X30,8X12 MSH
     AVAILABLE SHAPES  5        -0.000 PELLETS, BEADS, POWDER
       CRUSH STRENGTH  6        21.000 1/8 INCH PELLETS
             HARDNESS  7         0.000
            PORE SIZE  8         4.000 ALL FORMS
          PORE VOLUME  9         0.000
         SURFACE AREA 10         0.000
         BULK DENSITY 11        46.000 1/16 INCH PELLETS
       CRYSTALLINITY 12        -0.000 POWDER FORM-CUBIC
    CRYSTALLITE SIZE 13         0.000
          MAJOR USES 14        -0.000 DEHYDRATION; DESSICANT
          MAJOR USES 15         0.000
          VOLATILITY 16         0.000
    PARTICLE DENSITY 17         0.000
      MAX. OP. TEMP. 18         0.000
           ATTRITION 19         0.000
            COMMENTS 20         0.000


MATERIAL CODE UC301                                   MATERIAL CODE UC301

       CLASSIFICATION  1         0.000 CAT, PALLADIUM ON MOL. SIEVE
          COMPOSITION  2         0.000 PD 0.5
     COST, 2CD ACTIVE  3     56000.000 MOLECULAR SIEVE STRUCTURE
      AVAILABLE SIZES  4        -0.000 3/16X3/16
     AVAILABLE SHAPES  5        -0.000 TABLETS
       CRUSH STRENGTH  6         0.000
             HARDNESS  7         0.000
            PORE SIZE  8         0.000
          PORE VOLUME  9         0.000
         SURFACE AREA 10       500.000
         BULK DENSITY 11        44.000
       CRYSTALLINITY 12         0.000
    CRYSTALLITE SIZE 13         0.000
          MAJOR USES 14        -0.000 PENTANE-HEXANE ISOMERIZATION
          MAJOR USES 15         0.000
          VOLATILITY 16         0.000
    PARTICLE DENSITY 17         0.000
      MAX. OP. TEMP. 18         0.000
           ATTRITION 19         0.000
            COMMENTS 20         0.000
```

```
MATERIAL CODE UC302                                              MATERIAL CODE UC302

            CLASSIFICATION  1          0.000 CAT, PALLADIUM ON MOL. SIEVE
               COMPOSITION  2          0.000 PD 0.5
          COST, 2CD ACTIVE  3      56000.000 MN 5.2, MOL. SIEVE STRUCTURE
           AVAILABLE SIZES  4         -0.000 3/16X3/16 INCH
          AVAILABLE SHAPES  5         -0.000 TABLETS
            CRUSH STRENGTH  6          0.000
                  HARDNESS  7          0.000
                 PORE SIZE  8          0.000
               PORE VOLUME  9          0.000
              SURFACE AREA 10        500.000
              BULK DENSITY 11         37.000
             CRYSTALLINITY 12          0.000
          CRYSTALLITE SIZE 13          0.000
               MAJOR USES  14         -0.000 BUTANE ISOMERIZATION
               MAJOR USES  15          0.000
                VOLATILITY 16          0.000
          PARTICLE DENSITY 17          0.000
           MAX. OP. TEMP.  18          0.000
                 ATTRITION 19          0.000
                  COMMENTS 20          0.000


MATERIAL CODE UC303                                              MATERIAL CODE UC303

            CLASSIFICATION  1          0.000 CAT, PLATINUM ON MOL. SIEVE
               COMPOSITION  2          0.000 PT 0.5
          COST, 2CD ACTIVE  3      80000.000 MOLECULAR SIEVE STRUCTURE
           AVAILABLE SIZES  4         -0.000 3/16X3/16 INCH
          AVAILABLE SHAPES  5         -0.000 TABLETS
            CRUSH STRENGTH  6          0.000
                  HARDNESS  7          0.000
                 PORE SIZE  8          0.000
               PORE VOLUME  9          0.000
              SURFACE AREA 10        500.000
              BULK DENSITY 11         40.500
             CRYSTALLINITY 12          0.000
          CRYSTALLITE SIZE 13          0.000
               MAJOR USES  14         -0.000 REFORMING
               MAJOR USES  15          0.000
                VOLATILITY 16          0.000
          PARTICLE DENSITY 17          0.000
           MAX. OP. TEMP.  18          0.000
                 ATTRITION 19          0.000
                  COMMENTS 20          0.000
```

```
MATERIAL CODE UC304                                  MATERIAL CODE UC304

      CLASSIFICATION  1        0.000 CAT, PALLADIUM ON MOL. SIEVE
         COMPOSITION  2        0.000 PD 0.5
     COST, 2CD ACTIVE  3   80000.000 MOLECULAR SIEVE STRUCTURE
     AVAILABLE SIZES  4       -0.000 3/16X3/16 INCH
    AVAILABLE SHAPES  5       -0.000 TABLETS
      CRUSH STRENGTH  6        0.000
            HARDNESS  7        0.000
           PORE SIZE  8        0.000
         PORE VOLUME  9        0.000
        SURFACE AREA 10      500.000
        BULK DENSITY 11       40.500
       CRYSTALLINITY 12        0.000
    CRYSTALLITE SIZE 13        0.000
          MAJOR USES 14       -0.000 HYDROGENATION
          MAJOR USES 15        0.000
          VOLATILITY 16        0.000
    PARTICLE DENSITY 17        0.000
     MAX. OP. TEMP. 18        0.000
           ATTRITION 19        0.000
            COMMENTS 20        0.000


MATERIAL CODE UC305                                  MATERIAL CODE UC305

      CLASSIFICATION  1        0.000 CAT, PALLADIUM ON MOL. SIEVE
         COMPOSITION  2        0.000 PD 0.5
     COST, 2CD ACTIVE  3   80000.000 MOLECULAR SIEVE STRUCTURE
     AVAILABLE SIZES  4       -0.000 3/16X3/16 INCH
    AVAILABLE SHAPES  5       -0.000 TABLETS
      CRUSH STRENGTH  6        0.000
            HARDNESS  7        0.000
           PORE SIZE  8        0.000
         PORE VOLUME  9        0.000
        SURFACE AREA 10      500.000
        BULK DENSITY 11       40.500
       CRYSTALLINITY 12        0.000
    CRYSTALLITE SIZE 13        0.000
          MAJOR USES 14       -0.000 HYDROGENATION
          MAJOR USES 15        0.000
          VOLATILITY 16        0.000
    PARTICLE DENSITY 17        0.000
     MAX. OP. TEMP. 18        0.000
           ATTRITION 19        0.000
            COMMENTS 20        0.000
```

```
MATERIAL CODE UC306                                    MATERIAL CODE UC306

     CLASSIFICATION  1          0.000 CAT, NICKEL ON MOLECULAR SIEVE
        COMPOSITION  2          0.000 NI 1.0
   COST, 2CD ACTIVE  3      26000.000 MOLECULAR SIEVE STRUCTURE
    AVAILABLE SIZES  4         -0.000 3/16X3/16 INCH
   AVAILABLE SHAPES  5         -0.000 TABLETS
     CRUSH STRENGTH  6          0.000
           HARDNESS  7          0.000
          PORE SIZE  8          0.000
        PORE VOLUME  9          0.000
       SURFACE AREA 10        500.000
       BULK DENSITY 11         40.500
     CRYSTALLINITY 12           0.000
  CRYSTALLITE SIZE 13           0.000
        MAJOR USES 14          -0.000 HYDRODEALKYLATION
        MAJOR USES 15           0.000
        VOLATILITY 16           0.000
  PARTICLE DENSITY 17           0.000
    MAX. OP. TEMP. 18           0.000
         ATTRITION 19           0.000
          COMMENTS 20           0.000

MATERIAL CODE UC307                                    MATERIAL CODE UC307

     CLASSIFICATION  1          0.000 CAT, COPPER ON MOLECULAR SIEVE
        COMPOSITION  2          0.000 CU 1.0
   COST, 2CD ACTIVE  3      26000.000 MOLECULAR SIEVE STRUCTURE
    AVAILABLE SIZES  4         -0.000 3/16X3/16 INCH
   AVAILABLE SHAPES  5         -0.000 TABLETS
     CRUSH STRENGTH  6          0.000
           HARDNESS  7          0.000
          PORE SIZE  8          0.000
        PORE VOLUME  9          0.000
       SURFACE AREA 10        500.000
       BULK DENSITY 11         40.500
     CRYSTALLINITY 12           0.000
  CRYSTALLITE SIZE 13           0.000
        MAJOR USES 14          -0.000 HYDRODEALKYLATION
        MAJOR USES 15           0.000
        VOLATILITY 16           0.000
  PARTICLE DENSITY 17           0.000
    MAX. OP. TEMP. 18           0.000
         ATTRITION 19           0.000
          COMMENTS 20           0.000
```

```
MATERIAL CODE UC401                                     MATERIAL CODE UC401

       CLASSIFICATION  1          0.000
          COMPOSITION  2          0.000
     COST, 2CD ACTIVE  3          0.000
      AVAILABLE SIZES  4          0.000
     AVAILABLE SHAPES  5          0.000
       CRUSH STRENGTH  6          0.000
             HARDNESS  7          0.000
            PORE SIZE  8          0.000
          PORE VOLUME  9          0.000
         SURFACE AREA 10          0.000
         BULK DENSITY 11          0.000
        CRYSTALLINITY 12          0.000
     CRYSTALLITE SIZE 13          0.000
          MAJOR USES 14          0.000
          MAJOR USES 15          0.000
           VOLATILITY 16          0.000
     PARTICLE DENSITY 17          0.000
       MAX. OP. TEMP. 18          0.000
            ATTRITION 19          0.000
             COMMENTS 20          0.000

MATERIAL CODE UC402                                     MATERIAL CODE UC402

       CLASSIFICATION  1         -0.000 CAT, MOLECULAR SIEVE
          COMPOSITION  2         -0.000 NOT GIVEN
     COST, 2CD ACTIVE  3      26000.000 NOT GIVEN
      AVAILABLE SIZES  4         -0.000 3/16X3/16 INCH
     AVAILABLE SHAPES  5         -0.000 TABLETS
       CRUSH STRENGTH  6         20.000
             HARDNESS  7          0.000
            PORE SIZE  8          0.000
          PORE VOLUME  9          0.000
         SURFACE AREA 10        550.000
         BULK DENSITY 11         44.000
        CRYSTALLINITY 12          0.000
     CRYSTALLITE SIZE 13          0.000
           MAJOR USES 14         -0.000 ALKYLATION
           MAJOR USES 15          0.000
           VOLATILITY 16          0.000
     PARTICLE DENSITY 17          0.000
       MAX. OP. TEMP. 18          0.000
            ATTRITION 19          0.000
             COMMENTS 20          0.000
```

```
MATERIAL CODE UC501                                              MATERIAL CODE UC501

           CLASSIFICATION  1          -0.000 CAT, MOLECULAR SIEVE
              COMPOSITION  2          -0.000 NOT GIVEN
        COST, 2CD ACTIVE  3        2600.000 NOT GIVEN
         AVAILABLE SIZES  4           0.000 1/8X1/8 INCH
        AVAILABLE SHAPES  5           0.000 TABLET,ANHYDROUS
          CRUSH STRENGTH  6          30.000
                HARDNESS  7           0.000
               PORE SIZE  8           0.000
             PORE VOLUME  9           0.000
            SURFACE AREA 10         550.000 GREATER THAN
            BULK DENSITY 11          46.200
          CRYSTALLINITY 12           0.000
       CRYSTALLITE SIZE 13           0.000
              MAJOR USES 14           0.000 ISOMERIZATION PENTANE,HEXANE
              MAJOR USES 15           0.000
              VOLATILITY 16           0.000
        PARTICLE DENSITY 17           0.000
          MAX. OP. TEMP. 18        1000.000 MAXIMUM
               ATTRITION 19           0.000
                COMMENTS 20           0.000


MATERIAL CODE XY101                                              MATERIAL CODE XY101

           CLASSIFICATION  1          -0.000 CAT, PLATINUM ON ALUMINA COMB
              COMPOSITION  2          -0.000 NOT GIVEN
        COST, 2CD ACTIVE  3      250000.000 NOT GIVEN
         AVAILABLE SIZES  4           0.000
        AVAILABLE SHAPES  5           0.000
          CRUSH STRENGTH  6           0.000
                HARDNESS  7           0.000
               PORE SIZE  8           0.000
             PORE VOLUME  9           0.000
            SURFACE AREA 10          10.000
            BULK DENSITY 11           0.000
          CRYSTALLINITY 12           0.000
       CRYSTALLITE SIZE 13           0.000
              MAJOR USES 14          -0.000 NOX FUMES, HNO3 TAILS GASES
              MAJOR USES 15           0.000
              VOLATILITY 16           0.000
        PARTICLE DENSITY 17           0.000
          MAX. OP. TEMP. 18           0.000
               ATTRITION 19           0.000
                COMMENTS 20          -0.000 SIMILAR TORVEX DP101
```